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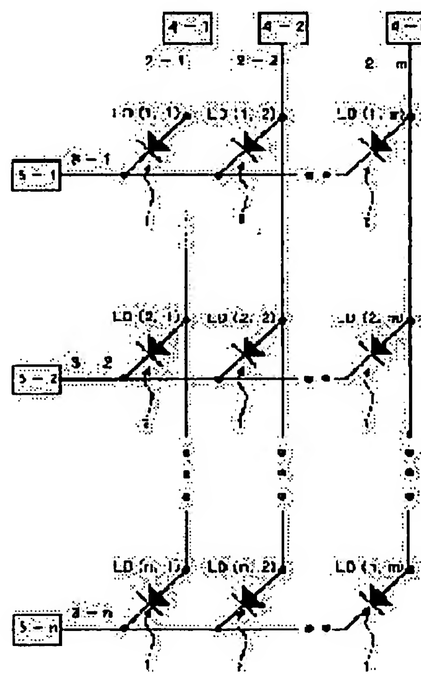
(54) TWO-DIMENSIONAL SEMICONDUCTOR LASER ARRAY LIGHT EMITTING DEVICE AND ITS DRIVING METHOD

(57)Abstract:



PROBLEM TO BE SOLVED: To provide a two-dimensional semiconductor laser array light emitting device with excellent luminous-intensity controllability, having a structure where vertical resonance type semiconductor lasers are provided in respective intersection regions between a plurality of row wiriness and column wirings, which prevents abnormal light emission of semiconductor laser due to electrostatic capacity caused around the respective intersection regions, and a driving method of the device.

SOLUTION: The device comprises vertical resonance type semiconductor lasers LD having cathode electrodes connected to row wirings 3 and anode electrodes connected to column wirings 2, optical-amount setting voltage applying means 5 for applying an optical-amount setting voltage to a selected row wiring to set the luminous intensity of the vertical resonance type semiconductor laser LD, while applying a non-emission setting voltage to unselected row wirings to prevent light emission of the LDs, and laser-drive voltage applying means 4 for applying a laser drive-pulse voltage to a selected column wiring, while applying a laser non-drive voltage to unselected column wirings to prevent light emission of the LDs.

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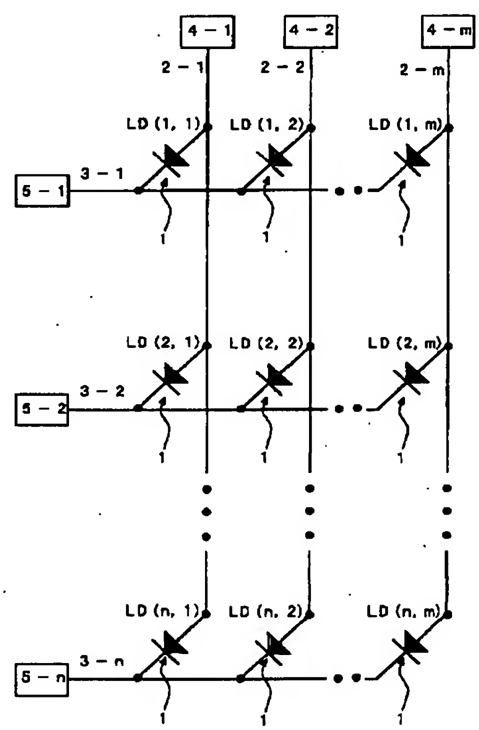
(54)【発明の名称】　２次元半導体レーザアレイ発光装置及びその駆動方法

(57)【要約】

【課題】本発明は、複数の行配線と複数の列配線の各交差領域に垂直共振型半導体レーザを配置した２次元半導体レーザアレイ発光装置及びその駆動方法に関し、各交差領域近傍に生じる静電容量に起因する半導体レーザの異常発光を防止し、発光強度の制御性に優れた２次元半導体レーザアレイ発光装置及びその駆動方法を提供することを目的とする。

【解決手段】行配線３に接続されたカソード電極と列配線２に接続されたアノード電極とを有する垂直共振型半導体レーザＬＤと、選択した選択行配線に対して垂直共振型半導体レーザＬＤの発光強度を設定する光量設定電圧を印加し、非選択行配線に対してレーザＬＤを非発光にする非発光設定電圧を印加する光量設定電圧印加手段５と、選択した選択列配線に対してレーザ駆動パルス電圧を印加し、非選択列配線に対してレーザの非発光を指示するレーザ非駆動電圧を印加するレーザ駆動電圧印加手段４を備えるように構成する。



【特許請求の範囲】

【請求項１】基板上に形成された複数の行配線と、

前記複数の行配線と交差して形成された複数の列配線と、

前記行配線及び列配線の各交差領域近傍にそれぞれ形成され、前記行配線に接続された第１電極と前記列配線に接続された第２電極とを有し、前記基板の基板面に対してほぼ垂直方向に発光する複数の垂直共振型半導体レーザ素子と、

前記複数の行配線から選択した選択行配線に対して第１の電圧を印加し、非選択行配線に対して第２の電圧を印加する第１の電圧印加手段と、

前記複数の列配線から選択した選択列配線に対して第３の電圧を印加し、非選択列配線に対して第４の電圧を印加する第２の電圧印加手段とを備えたことを特徴とする２次元半導体レーザアレイ発光装置。

【請求項２】請求項１記載の２次元半導体レーザアレイ発光装置において、

前記第１電極はカソード電極であり、

前記第２電極はアノード電極であり、

前記第１の電圧は、前記選択行配線及び選択列配線に接続された選択された垂直共振型半導体レーザ素子の発光強度を設定する光量設定電圧であり、

前記第２の電圧は、前記選択された垂直共振型半導体レーザ素子以外の垂直共振型半導体レーザ素子を非発光にする非発光設定電圧であり、

前記第１の電圧印加手段は、前記選択された垂直共振型半導体レーザ素子の発光前に前記光量設定電圧及び非発光設定電圧を予め所定の行配線に印加する光量設定電圧印加手段であり、

前記第３の電圧は、前記選択された垂直共振型半導体レーザ素子の発光を指示するレーザ駆動電圧レベル及び非発光を指示するレーザ非駆動電圧レベルからなるレーザ駆動パルス電圧であり、

前記第４の電圧は、前記選択された垂直共振型半導体レーザ素子以外の垂直共振型半導体レーザ素子の非発光を指示するレーザ非駆動電圧であり、

前記第２の電圧印加手段は、前記レーザ駆動パルス電圧及び前記レーザ非駆動電圧を所定の列配線に印加するレーザ駆動電圧印加手段であることを特徴とする２次元半導体レーザアレイ発光装置。

【請求項３】請求項１記載の２次元半導体レーザアレイ発光装置において、

前記第１電極はアノード電極であり、

前記第２電極はカソード電極であり、

前記第１の電圧は、前記選択行配線及び選択列配線に接続された選択された垂直共振型半導体レーザ素子の発光を指示するレーザ駆動電圧レベル及び非発光を指示するレーザ非駆動電圧レベルからなるレーザ駆動パルス電圧であり、

前記第２の電圧は、前記選択された垂直共振型半導体レーザ素子以外の垂直共振型半導体レーザ素子の非発光タイミングを指示するレーザ非駆動電圧であり、

前記第１の電圧印加手段は、前記レーザ駆動パルス電圧及び前記レーザ非駆動電圧を所定の行配線に印加するレーザ駆動電圧印加手段であり、

前記第３の電圧は、前記選択された垂直共振型半導体レーザ素子の発光強度を設定する光量設定電圧であり、

前記第４の電圧は、前記選択された垂直共振型半導体レーザ素子以外の垂直共振型半導体レーザ素子を非発光にする非発光設定電圧であり、

前記第２の電圧印加手段は、前記選択された垂直共振型半導体レーザ素子の発光前に前記光量設定電圧及び非発光設定電圧を予め所定の列配線に印加する光量設定電圧印加手段であることを特徴とする２次元半導体レーザアレイ発光装置。

【請求項４】請求項１記載の２次元半導体レーザアレイ発光装置において、

前記第１電極はカソード電極であり、

前記第２電極はアノード電極であり、

前記第１の電圧は、前記選択行配線及び選択列配線に接続された選択された垂直共振型半導体レーザ素子の発光を指示するレーザ駆動電圧レベル及び非発光を指示するレーザ非駆動電圧レベルからなるレーザ駆動パルス電圧であり、

前記第２の電圧は、前記選択された垂直共振型半導体レーザ素子以外の垂直共振型半導体レーザ素子の非発光タイミングを指示するレーザ非駆動電圧であり、

前記第１の電圧印加手段は、前記レーザ駆動パルス電圧及び前記レーザ非駆動電圧を所定の行配線に印加するレーザ駆動電圧印加手段であり、

前記第３の電圧は、前記選択された垂直共振型半導体レーザ素子の発光強度を設定する光量設定電圧であり、

前記第４の電圧は、前記選択された垂直共振型半導体レーザ素子以外の垂直共振型半導体レーザ素子を非発光にする非発光設定電圧であり、

前記第２の電圧印加手段は、前記選択された垂直共振型半導体レーザ素子の発光前に前記光量設定電圧及び非発光設定電圧を予め所定の列配線に印加する光量設定電圧印加手段であることを特徴とする２次元半導体レーザアレイ発光装置。

【請求項５】請求項１記載の２次元半導体レーザアレイ発光装置において、

前記第１電極はアノード電極であり、

前記第２電極はカソード電極であり、

前記第１の電圧は、前記選択行配線及び選択列配線に接続された選択された垂直共振型半導体レーザ素子の発光強度を設定する光量設定電圧であり、

前記第２の電圧は、前記選択された垂直共振型半導体レーザ素子以外の垂直共振型半導体レーザ素子を非発光に

する非発光設定電圧であり、
前記第１の電圧印加手段は、前記選択された垂直共振型半導体レーザ素子の発光前に前記光量設定電圧及び非発光設定電圧を予め所定の行配線に印加する光量設定電圧印加手段であり、
前記第３の電圧は、前記選択された垂直共振型半導体レーザ素子の発光を指示するレーザ駆動電圧レベル及び非発光を指示するレーザ非駆動電圧レベルからなるレーザ駆動パルス電圧であり、
前記第４の電圧は、前記選択された垂直共振型半導体レーザ素子以外の垂直共振型半導体レーザ素子の非発光タイミングを指示するレーザ非駆動電圧であり、
前記第２の電圧印加手段は、前記レーザ駆動パルス電圧及び前記レーザ非駆動電圧を所定の列配線に印加するレーザ駆動電圧印加手段であることを特徴とする２次元半導体レーザアレイ発光装置。

【請求項６】請求項２又は３に記載の２次元半導体レーザアレイ発光装置において、
前記非発光設定電圧の電圧レベルは、前記レーザ駆動パルス電圧のレーザ駆動電圧レベルとほぼ等しいかそれより高いこと、および前記光量設定電圧は、前記レーザ駆動パルス電圧のレーザ非駆動電圧レベルとほぼ等しいかそれより高いことを特徴とする２次元半導体レーザアレイ発光装置。

【請求項７】請求項２又は３に記載の２次元半導体レーザアレイ発光装置において、
前記非発光設定電圧の電圧レベルは、前記レーザ駆動パルス電圧のレーザ駆動電圧レベルからレーザの閾値電圧を引いた電圧レベルとほぼ等しいかそれより高いこと、および前記光量設定電圧は、前記レーザ駆動パルス電圧のレーザ非駆動電圧レベルからレーザの閾値電圧を引いた電圧レベルとほぼ等しいかそれより高いことを特徴とする２次元半導体レーザアレイ発光装置。

【請求項８】請求項４又は５に記載の２次元半導体レーザアレイ発光装置において、
前記非発光設定電圧の電圧レベルは、前記レーザ駆動パルス電圧のレーザ駆動電圧レベルとほぼ等しいかそれより低いこと、および前記光量設定電圧は、前記レーザ駆動パルス電圧のレーザ非駆動電圧レベルとほぼ等しいかそれより低いことを特徴とする２次元半導体レーザアレイ発光装置。

【請求項９】請求項４又は５に記載の２次元半導体レーザアレイ発光装置において、
前記非発光設定電圧の電圧レベルは、前記レーザ駆動パルス電圧のレーザ駆動電圧レベルからレーザの閾値電圧を引いた電圧レベルとほぼ等しいかそれより低いこと、および前記光量設定電圧は、前記レーザ駆動パルス電圧のレーザ非駆動電圧レベルからレーザの閾値電圧を引いた電圧レベルとほぼ等しいかそれより低いことを特徴とする２次元半導体レーザアレイ発光装置。

【請求項１０】複数の行配線及び列配線の交差領域にそれぞれ形成され、行配線または列配線の一方に接続されたカソード電極と他方に接続されたアノード電極とを有する垂直共振型半導体レーザ素子に対して、非発光状態での前記カソード電極の電位が、前記アノード電極の電位とほぼ等しいかそれより高くなるようにすることを特徴とする２次元半導体レーザアレイ発光装置の駆動方法。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は、複数の行配線と複数の列配線の各交差領域に垂直共振型半導体レーザ素子を配置した２次元半導体レーザアレイ発光装置及びその駆動方法に関する。

【０００２】

【従来の技術】従来、基板上の複数の行配線と複数の列配線の各交差領域近傍に半導体レーザ素子を形成し、マトリクス状に配置された半導体レーザアレイにより２次元（面）発光させる半導体レーザアレイ発光装置として、特開平２－１９８１８４号公報、特開平７－８６６９１号公報等に開示がある。特開平２－１９８１８４号公報に開示された２次元半導体レーザアレイは、素子形成領域に半絶縁膜の電流ブロック層を形成し、基板側の所望部に基板とは反導電型の不純物を添加して素子分離領域を形成し、さらに、上下部にそれぞれカソード電極、アノード電極を形成することにより、基板面に対して垂直方向にレーザ共振器端面が形成された垂直共振型半導体レーザ素子をマトリクス状に形成したものである。また、特開平７－８６６９１号公報に開示された２次元半導体レーザアレイは、絶縁性の基板に水平共振型の面発光レーザ素子を２次元に配置し、各面発光レーザ素子の共振器長方向に延長して下層電極をライン状に形成し、ライン毎に電極絶縁部を設け、下層電極と直交するライン状パターンに上層電極を設けた構成となっている。

【０００３】上述のような２次元半導体レーザアレイを発光させるレーザ駆動方法を以下に説明する。初めに、マトリクス状に配置されていない単体の半導体レーザ素子や１次元半導体レーザアレイにおけるレーザ駆動方法を説明する。これら単体の半導体レーザ素子あるいは１次元半導体レーザアレイは、定電流または電流パルスを用いて駆動させるのが一般に行われている。またレーザ発光強度を変化させようとする場合には、レーザ光の一部を光センサに導光し、光センサの出力を基準値が等しくなるように負帰還の閉ループを構成して、定電流または電流パルスの値を調整するようにしてレーザ発光強度の制御を行っている。

【０００４】このように半導体レーザ素子の駆動に定電流または電流パルスが用いられるのは、第１に半導体レーザ素子はその発光領域に狭搾された電流によりレーザ

発振が生じ、レーザ光量はその電流量に比例する特性を有しているという半導体レーザ素子の動作原理に基づいている。第2に、従来、半導体レーザ素子や１次元半導体レーザアレイには水平共振型半導体レーザ素子が用いられており、その動作特性に基づいて定電流または電流パルスによる駆動が行われている。

【０００５】図１２に水平共振型半導体レーザ素子の電流－電圧（Ｉ－Ｖ）特性及び電流／発光強度（Ｉ－Ｌ）特性を示す。図１２において水平共振型半導体レーザ素子のＩ－Ｌ特性を示す曲線の傾きは０．５～１．０ｍＷ／ｍＡ　程度であるのに対し、Ｉ－Ｖ特性を示す曲線の傾きは０．０１　Ｖ／ｍＡ　程度である。図１２において例えば発光強度Ｐ１～Ｐ２の間を８ｂｉｔの分解能で発光強度を制御する場合を考える。このとき発光強度の制御因子として電流を選べば、図１２の駆動電流Ｉ１～Ｉ２の広範囲を８ｂｉｔの分解能で制御すればよいので発光強度の制御は容易である。ところが発光強度の制御因子として電圧を選ぶと、図１２の電圧Ｖ１～Ｖ２の極めて狭い範囲を８ｂｉｔの分解能で制御しなければならないが、このような狭い電圧範囲を８ｂｉｔ分解能で制御できる制御装置の実現は困難である。またこのような狭範囲では微弱なノイズが混入しただけでも所望の発光強度Ｐ１～Ｐ２の範囲を大きく外れてしまい素子が破壊されてしまうことも生じ得る。

【０００６】以上の理由により、水平共振型の半導体レーザ素子や１次元半導体レーザアレイでは、電流を制御することにより駆動および発光強度の制御を行うのが一般的であった。一方、垂直共振型半導体レーザ素子の場合には、図１３に示すように電流－電圧（Ｉ－Ｖ）特性が水平共振型半導体レーザ素子より優れており、電圧駆動させることが可能である。図１３に示したように垂直共振型半導体レーザ素子のＩ－Ｖ特性を示す曲線の傾きは０．５　Ｖ／ｍＡ程度であり　図１２の水平共振型半導体レーザ素子の０．０１　Ｖ／ｍＡ程度に比して、例えば発光強度Ｐ１～Ｐ２の間を８ｂｉｔの分解能で制御する場合でも、Ｖ１～Ｖ２の比較的広い範囲の電圧を８ｂｉｔの分解能で制御できればよいので基本的に電圧駆動の可能性を有している。しかしながら、垂直共振型半導体レーザ素子は水平共振型半導体レーザ素子と同様のＩ－Ｌ特性を有していることから、低周波数パルスでの駆動であれば専ら電流制御による駆動方式が採用されている。

【０００７】さて、基板上の複数の行配線と複数の列配線の各交差領域近傍にマトリクス状に配置した水平共振型あるいは垂直共振型の半導体レーザ素子で構成される２次元半導体レーザアレイについて、上述の半導体レーザ素子や１次元半導体レーザアレイを駆動したのと同様に電流パルスでパルス駆動させる場合について説明する。

【０００８】２次元半導体レーザアレイの構造を図８に示す。図８において、基板上に複数の行方向に伸びる行配線３が形成され、絶縁膜を介して行配線に対して直交する列配線３が形成されている。各行配線３及び列配線２には添え字（－１、－２等）を付して各配線を区別して示している。２次元半導体レーザアレイは、図中番号１で示すように複数の行配線３及び列配線２の交差領域に形成され、ｎ行×ｍ列のマトリクス状に配置された複数の半導体レーザ素子ＬＤを有している。図中半導体レーザ素子ＬＤには添え字（ｎ，ｍ）を付している。列配線２の一端部には、列配線２の任意の１列を選択して、選択された列配線２にイネーブル電圧を発生させるイネーブル電圧発生部１８が設けられている。行配線３の一端部には、選択された列配線２上の半導体レーザ素子の発光強度と発光タイミングを指示するための電流パルスを発生する駆動電流パルス発生部１７が設けられている。図中各イネーブル電圧発生部１８及び駆動電流パルス発生部１７にも各配線に対応する添え字（－１、－２等）を付して区別して示している。

【０００９】ｎ行×ｍ列の２次元半導体レーザアレイの半導体レーザ素子ＬＤ（１，１）～ＬＤ（ｎ，ｍ）は、カソード電極がｎ本の行配線３－１～３－ｎにそれぞれ接続され、それぞれ行配線３－１～３－ｎに接続された駆動電流パルス発生部１７－１～１７－ｎから電流が供給されるようになっている。また、各アノード電極はｍ本の列配線２－１～２－ｎに接続され、それぞれ列配線２－１～２－ｎに接続されたイネーブル電圧発生部１８－１～１８－ｎから電圧を印加されるようになっている。また、図中番号１で示した行配線及び列配線の各交差領域に発生する静電容量をＣ（１，１）～Ｃ（ｎ，ｍ）として示している。

【００１０】次に、このような構成の２次元半導体レーザアレイについて、アナログ電気回路の標準的なシミュレータを用いて、２次元半導体レーザアレイを駆動したときの、半導体レーザ素子ＬＤ（１，１）～ＬＤ（ｎ，ｍ）に流れる電流を求めた結果を図１０及び１１を用いて説明する。図１０（ａ）はイネーブル電圧発生部１８－１の発生する電位を示し、図１０（ｂ）はイネーブル電圧発生部１８－２～１８－ｍの発生する電位を示している。図１０（ｃ）は電流パルス発生部１７－１の発生する電流パルスを示し、図１０（ｄ）は電流パルス発生部１７－２～１７－ｎの発生する電流を示している。図１１（ａ）は半導体レーザ素子ＬＤ（１，１）に流れる電流、図１１（ｂ）は半導体レーザ素子ＬＤ（２，１）～ＬＤ（ｎ，１）に流れる電流、図１１（ｃ）は行配線３－１の電位、図１１（ｄ）は行配線３－２～３－ｎの電位を示している。

【００１１】このシミュレーション例では、イネーブル電圧発生部１８のうち列配線２－１に接続されたイネーブル電圧発生部１８－１のみにイネーブル電位（１２Ｖ）を与え、他の列配線２－２～２－ｍのイネーブル電

圧発生部１８－２～１８－mにはディセーブル電位（０Ｖ）を与えることにより列配線２－１のみを選択している（図１０（ａ）、（ｂ）参照）。また電流パルス発生部１７のうち行配線３－１に接続された電流パルス発生部１７－１のみに駆動電流パルスを与え、他の行配線１７－２～ｎに接続された電流パルス発生部１７－２～１７－ｎは駆動電流をゼロにしている（図１０（ｃ）、（ｄ）参照）。すなわち、本シミュレーション例では図８における半導体レーザ素子ＬＤ（１，１）のみを所望のタイミングでパルス発光させ、他の半導体レーザ素子ＬＤ（１，２）～ＬＤ（ｎ，ｍ）は常に消灯させるように駆動させせようとした場合のシミュレーション結果である。

【００１２】駆動電流パルス発生部１７－１の発生する電流パルスを示す図１０（ｃ）において、約２１ｎｓから４３ｎｓの間に電流パルス発生部１７－１は８ｍＡのパルス電流を行配線３－１に供給しているが、このときイネーブル電圧発生部１８－１はイネーブル電位ではない（即ちディセーブル電位である）ので、半導体レーザ素子ＬＤに流れる電流を示している図１１（ａ）、（ｂ）に示すように、選択された列配線２－１の全半導体レーザ素子ＬＤ（１，１）～ＬＤ（ｎ，１）には電流が流れず、従ってレーザ発光もない正常な状態を保っている。しかしながら、約６１ｎｓ～８３ｎｓ間の電流パルス発生部１７－１が発生するパルス電流に対しては状況が異なり、図１１（ａ）、（ｂ）に示すように、半導体レーザ素子ＬＤ（１，１）～ＬＤ（ｎ，１）が異常発光してしまっている。

【００１３】図１０（ａ）においてイネーブル電圧発生部１８－１がイネーブル電位になる約４５ｎｓの時点に合わせて、半導体レーザ素子ＬＤ（１，１）に不正な電流が流れ始め（図１１（ａ）参照）、この不正な電流は電流パルス発生部１７－１が図１０（ｃ）のようにパルス電流を供給し終えた約８３ｎｓ以降も続き、イネーブル電圧発生部１８－１がディセーブル電位に戻る約８７ｎｓの時点（図１０（ａ）参照）まで続く。図１１（ａ）、（ｂ）に補助線として示した２次元半導体レーザアレイのレーザ発光の閾値電流を３ｍＡとすると、この不正電流は閾値を越えてしまい、半導体レーザ素子ＬＤ（１，１）は意図しないタイミングでレーザ発光をしてしまう。さらにこのとき、電流パルス発生部１７から全く駆動電流を供給されていないはずの半導体レーザ素子ＬＤ（２，１）～ＬＤ（ｎ，１）にも不正な電流が流れ（図１１（ｂ）参照）、レーザ発光の閾値を越えて異常発光する。

【００１４】

【発明が解決しようとする課題】これらの不正な電流が問題となるのは、ナノ秒オーダーの高い周波数で半導体レーザ素子をパルス駆動させようとすると、マトリクス配線間の静電容量（図８のＣ（１，１）～Ｃ（ｎ，

ｍ））の存在が無視できないものになってくることによる。この不正電流発生の理由をイネーブル電圧発生部１８－１がイネーブル、１８－２～１８－ｍがディセーブルの場合について図９を用いて説明する。図９は理解を容易にするために図８に示した２次元半導体レーザアレイの構成を表現し直したものであり、図８の構成と異なる点はない。図９において、イネーブル電圧発生部１８－１がイネーブル電位（１２Ｖ）になった瞬間に、矢印付破線で示したように半導体レーザ素子ＬＤ（１，１）を通して静電容量Ｃ（１，２）～Ｃ（１，ｍ）に電流が流れる。また同様に半導体レーザ素子ＬＤ（２，１）を通して静電容量Ｃ（２，２）～Ｃ（２，ｍ）に電流が流れ、半導体レーザ素子ＬＤ（ｎ，１）を通して静電容量Ｃ（ｎ，２）～Ｃ（ｎ，ｍ）に電流が流れてしまい、これが不正電流の原因となっている。また、静電容量Ｃ（１，２）～Ｃ（１，ｍ）、および静電容量Ｃ（２，２）～Ｃ（２，ｍ）、および静電容量Ｃ（ｎ，２）～Ｃ（ｎ，ｍ）は電荷の蓄積に伴い電位が上昇し、図１１（ｃ）、（ｄ）に示しような電位変化を示す。

【００１５】このような半導体レーザ素子ＬＤに流れる不正な電流は、駆動電流パルス発生部１７の発生する駆動電流に加算され半導体レーザ素子ＬＤ（１，１）～ＬＤ（ｎ，１）に供給され、その電流値は静電容量Ｃ（１，２）～Ｃ（１，ｍ）、および静電容量Ｃ（２，２）～Ｃ（２，ｍ）、および静電容量Ｃ（ｎ，２）～Ｃ（ｎ，ｍ）に蓄積された電荷に依存して変化するため、時々刻々と変化しており、従って半導体レーザ素子ＬＤの発光強度を制御することも極めて困難にしている。このように半導体レーザ素子を電流パルスで駆動する従来の駆動方法を２次元半導体レーザアレイ発光装置に適用すると、上述のような行及び列配線の交差部分に発生する静電容量により、非発光タイミングで半導体レーザ素子の異常発光が発生し、更には発光強度の制御が不可能になるという問題を有している。

【００１６】また例えば、ＳＰＩＥ Ｐｒｏｃｅｅｄｉｎｇｓ、Ｖｏｌ．２１４７、Ｐ．９に開示されたマトリクス配線の２次元半導体レーザアレイに関する駆動方法によれば、２次元半導体レーザアレイを従来の電流駆動に代えて電圧駆動させると電流駆動よりも安価で、条件によってはより安定に駆動できることが記載されている。しかし、マトリクス配線による静電容量の存在を前提にして、実用的で具体的な駆動装置及び駆動方法（駆動手順）は何ら開示されていない。

【００１７】本発明の目的は、複数の行配線と複数の列配線の各交差領域近傍に生じる静電容量に起因して半導体レーザ素子へ流れる不正な電流を生じさせない２次元半導体レーザアレイ発光装置及びその駆動方法を提供することにある。また本発明は、半導体レーザ素子の異常発光を防止し、発光強度の制御性に優れた２次元半導体レーザアレイ発光装置及びその駆動方法を提供すること

にある。

【0018】

【課題を解決するための手段】そこで、本発明者達は、マトリクス配線の２次元半導体レーザアレイを発光強度を制御しつつパルス駆動する方法について鋭意研究を重ねた結果、垂直共振型の２次元半導体レーザアレイに関し行配線（または、列配線）に光量設定電位を印加し、列配線（または、行配線）に発光タイミング電圧パルスを加える駆動方法を見出し、本発明に到達した。すなわち、上記目的は、基板上に形成された複数の行配線と、複数の行配線と交差して形成された複数の列配線と、行配線及び列配線の各交差領域近傍にそれぞれ形成され、行配線に接続された第１電極と列配線に接続された第２電極とを有し、基板の基板面に対してほぼ垂直方向に発光する複数の垂直共振型半導体レーザ素子と、複数の行配線から選択した選択行配線に対して第１の電圧を印加し、非選択行配線に対して第２の電圧を印加する第１の電圧印加手段と、複数の列配線から選択した選択列配線に対して第３の電圧を印加し、非選択列配線に対して第４の電圧を印加する第２の電圧印加手段とを備えた２次元半導体レーザアレイ発光装置により達成される。

【0019】より具体的に一実施の形態を表す図１及び図６、図７に対応付けて説明すると、複数の行配線（３－１～３－ｎ）及びそれらと交差して形成された複数の列配線（２－１～２－ｍ）と、行配線（３－１～３－ｎ）及び列配線（２－１～２－ｍ）の各交差領域１近傍にそれぞれ形成され、行配線（３－１～３－ｎ）に接続された第１電極（カソード電極）と列配線（２－１～２－ｍ）に接続された第２電極（アノード電極）とを有し、基板の基板面に対してほぼ垂直方向に発光する複数の垂直共振型半導体レーザ素子（ＬＤ（１，１）～ＬＤ（ｎ，ｍ））と、複数の行配線（３－１～３－ｎ）から選択した例えば選択行配線（３－１）に対して第１の電圧として垂直共振型半導体レーザ素子（ＬＤ（１，１））の発光強度を設定する光量設定電圧（０Ｖ～１２Ｖ）を印加し、非選択行配線に対して第２の電圧として選択された垂直共振型半導体レーザ素子以外の垂直共振型半導体レーザ素子を非発光にする非発光設定電圧（１２Ｖ）を印加する第１の電圧印加手段として、選択された垂直共振型半導体レーザ素子（ＬＤ（１，１））の発光前に光量設定電圧及び非発光設定電圧を予め所定の行配線（３－１～３－ｎ）に印加する光量設定電圧印加手段（５－１～５－ｎ）と、複数の列配線（２－１～２－ｍ）から選択した例えば選択列配線（２－１）に対して第３の電圧としての選択された垂直共振型半導体レーザ素子の発光を指示するレーザ駆動電圧レベル（１２Ｖ）及び非発光を指示するレーザ非駆動電圧レベル（０Ｖ）からなるレーザ駆動パルス電圧（図６（ａ）参照）を印加し、非選択列配線に対して第４の電圧としての選択された垂直共振型半導体レーザ素子以外の垂直共振型半導体レーザ素子の非発光を指示するレーザ非駆動電圧（０Ｖ）を印加する第２の電圧印加手段としてのレーザ駆動パルス電圧（０Ｖ及び１２Ｖ）及びレーザ非駆動電圧（０Ｖ）を所定の列配線に印加するレーザ駆動電圧印加手段（４－１～４－ｍ）を備えた２次元半導体レーザアレイ発光装置により上記目的は達成される。

【００２０】そして上記目的は、第１電極をアノード電極、第２電極をカソード電極とし、第１の電圧はレーザ駆動パルス電圧であり、第２の電圧はレーザ非駆動電圧であり、第１の電圧印加手段はレーザ駆動電圧印加手段であり、第３の電圧は光量設定電圧であり、第４の電圧は非発光設定電圧であり、第２の電圧印加手段は光量設定電圧印加手段であることを特徴とする２次元半導体レーザアレイ発光装置によっても達成される。上記２つの発光装置の場合、非発光設定電圧の電圧レベル（１２Ｖ）は、レーザ駆動パルス電圧のレーザ駆動電圧レベル（１２Ｖ）とほぼ等しいかそれより高く、光量設定電圧（０Ｖ～１２Ｖ）は、レーザ駆動パルス電圧のレーザ非駆動電圧レベル（０Ｖ）とほぼ等しいかそれより高い電圧レベルで駆動される。あるいは、非発光設定電圧の電圧レベルは、レーザ駆動パルス電圧のレーザ駆動電圧レベルからレーザの閾値電圧を引いた電圧レベルとほぼ等しいかそれより高く、光量設定電圧は、レーザ駆動パルス電圧のレーザ非駆動電圧レベルからレーザの閾値電圧を引いた電圧レベルとほぼ等しいかそれより高い電圧レベルで駆動される。

【００２１】さらに上記目的は、第１電極をカソード電極、第２電極をアノード電極とし、第１の電圧はレーザ駆動パルス電圧であり、第２の電圧はレーザ非駆動電圧であり、第１の電圧印加手段はレーザ駆動電圧印加手段であり、第３の電圧は光量設定電圧であり、第４の電圧は非発光設定電圧であり、第２の電圧印加手段は光量設定電圧印加手段であることを特徴とする２次元半導体レーザアレイ発光装置によっても達成される。またさらに上記目的は、第１電極をアノード電極、第２電極をカソード電極とし、第１の電圧は光量設定電圧であり、第２の電圧は非発光設定電圧であり、第１の電圧印加手段は光量設定電圧印加手段であり、第３の電圧はレーザ駆動パルス電圧であり、第４の電圧はレーザ非駆動電圧であり、第２の電圧印加手段はレーザ駆動電圧印加手段であることを特徴とする２次元半導体レーザアレイ発光装置によっても達成される。上記２つの発光装置の場合、非発光設定電圧の電圧レベルは、レーザ駆動パルス電圧のレーザ駆動電圧レベルとほぼ等しいかそれより低く、光量設定電圧は、レーザ駆動パルス電圧のレーザ非駆動電圧レベルとほぼ等しいかそれより低い電圧レベルで駆動される。あるいは、非発光設定電圧の電圧レベルは、レーザ駆動パルス電圧のレーザ駆動電圧レベルからレーザの閾値電圧を引いた電圧レベルとほぼ等しいかそれより低く、光量設定電圧は、レーザ駆動パルス電圧のレーザ

非駆動電圧レベルからレーザの閾値電圧を引いた電圧レベルとほぼ等しいかそれより低い電圧レベルで駆動される。

【0022】このように、選択した垂直共振型半導体レーザ素子の発光を指示するレーザ駆動電圧レベルでレーザ駆動電圧印加手段から電圧を印加するのに先立って、光量設定電圧印加手段により発光強度に応じた電位の光量設定電圧を予め設定するようにしている。さらに、レーザ駆動電圧印加手段のレーザ非駆動電圧レベルと、光量設定電圧印加手段の非発光設定電圧とが、半導体レーザ素子に対して逆方向の電位になるようにしている。

【0023】このように本発明では、マトリクス配線の垂直共振型2次元半導体レーザアレイに従来の電流パルスによる駆動を適用した際の問題点である図9に矢印付破線で示した不正電流を発生させないように、従来の駆動電流パルス発生部を電圧発生手段に変更し、電流源を使用する限り不可能な配線の電位制御を電圧源に代えることを可能にしている。こうすることにより配線の電位を制御して、半導体レーザ素子ＬＤ（１，１）～ＬＤ（ｎ，ｍ）に逆方向の電圧を印加することが可能となる。また図9において、静電容量Ｃ（１，２）～Ｃ（１，ｍ）、およびＣ（２，２）～Ｃ（２，ｍ）、およびＣ（ｎ，２）～Ｃ（ｎ，ｍ）は、電圧源のデカップリングコンデンサとして機能させることができる。このようにすることにより、マトリクス配線の垂直共振型2次元半導体レーザアレイ発光装置をその発光強度を制御しつつパルス駆動することが可能となる。

【0024】

【発明の実施の形態】本発明の実施の形態による２次元半導体レーザアレイ発光装置及びその駆動方法を図１乃至図７を用いて説明する。図１は本発明の実施の形態による２次元半導体レーザアレイ発光装置の構成を示す。図１において、基板上に複数の行方向に伸びる行配線３－１～３－ｎが形成され、絶縁膜（図示せず）を介して行配線に対して直交する列配線２－１～２－ｍが形成されている。２次元半導体レーザアレイは、図中番号１で示すように複数の行配線３－１～３－ｎ及び列配線２－１～２－ｍの交差領域に形成され、ｎ行×ｍ列のマトリクス状に配置された複数の垂直共振型半導体レーザ素子ＬＤ（１，１）～ＬＤ（ｎ，ｍ）を有している。各垂直共振型半導体レーザ素子ＬＤは、行配線３－１～３－ｎに接続されたカソード電極と列配線２－１～２－ｍに接続されたアノード電極とを有し、基板の基板面に対してほぼ垂直方向に発光するようになっている。

【0025】複数の行配線３－１～３－ｎには、垂直共振型半導体レーザ素子ＬＤ（１，１）～ＬＤ（ｎ，ｍ）に対して所望の垂直共振型半導体レーザ素子ＬＤの発光強度を予め設定するための光量設定電圧印加部５－１～５－ｎが接続されている。光量設定電圧印加部５－１～５－ｎからの出力電圧は、それぞれ行配線３－１～３－ｎに接続された垂直共振半導体レーザ素子ＬＤのカソード電極に印加される。垂直共振型半導体レーザ素子ＬＤを発光させる光量設定電圧は発光強度に応じて例えば０Ｖ～１２Ｖの範囲が用いられ、ほぼ１２Ｖで非発光状態となるようにしている。本実施の形態においては、半導体レーザ素子を発光させる光量設定電圧が印加される場合を選択状態とし、非発光状態の光量設定電圧（ほぼ１２Ｖ）がカソード電圧に印加される場合を非選択状態であるとし、この電圧（１２Ｖ）を非発光設定電圧と呼ぶことにする。

【0026】複数の列配線２－１～２－ｍには、垂直共振型半導体レーザ素子ＬＤ（１，１）～ＬＤ（ｎ，ｍ）に対して所望の垂直共振型半導体レーザ素子ＬＤの発光を指示するレーザ駆動電圧印加部４－１～４－ｍが接続されている。レーザ駆動電圧印加部４－１～４－ｎからの出力電圧は、それぞれ列配線２－１～２－ｎに接続された垂直共振半導体レーザ素子ＬＤのアノード電極に印加される。これらレーザ駆動電圧印加部４－１～４－ｍにより、選択した列配線に対しては垂直共振型半導体レーザ素子ＬＤの発光を指示するレーザ駆動電圧レベル（１２Ｖ）及び非発光を指示するレーザ非駆動電圧レベル（０Ｖ）からなるレーザ駆動パルス電圧を印加し、非選択列配線に対しては垂直共振型半導体レーザ素子ＬＤの非発光を指示するレーザ非駆動電圧（０Ｖ）を印加するようになっている。

【0027】次に、垂直共振型半導体レーザ素子ＬＤ（１，１）～ＬＤ（ｎ，ｍ）の代表的な等価回路を図４に示す。垂直共振型半導体レーザ素子ＬＤは、ダイオード１２とそれに直列接続された抵抗１３，１４、およびこれらに並列に接続されたコンデンサ１５により構成される。ダイオード１２は半導体レーザ素子そのものであり、ここに狭窄された電流によりレーザ光が発生する。抵抗１３，１４は、図１の行配線３とダイオード１２のカソード間、および列配線２とダイオード１２のアノード間の内部抵抗で、主にレーザ共振器の両端に位置する高反射率の層（ミラー層）が高抵抗なために発生し、数１００オームの抵抗値を持つ。コンデンサ１５は行配線３と列配線２が垂直共振型半導体レーザ素子ＬＤ（１，１）～ＬＤ（ｎ，ｍ）の所で、ある面積をもって向かい合っているために発生する浮遊容量とレーザ素子自体に付随する静電容量であり、通常その容量は１～５ｐＦである。

【0028】この静電容量（コンデンサ１５）は、図５にＣ（ｎ，ｍ）で示した通り、垂直共振型半導体レーザ素子ＬＤ（１，１）～ＬＤ（ｎ，ｍ）のそれぞれに発生し、その容量は１つ当たり数ｐＦであるが、１本の行配線３（または、列配線２）に着目するとｍ個（または、ｎ個）の静電容量Ｃ（コンデンサ１５）が接続しており、非発光タイミングにおける半導体レーザ素子の異常発光が発生したり、前述の通り従来の半導体レーザ駆動

方法である電流パルスによる駆動では、発光強度のコントロールを不可能にしたりする原因である。なお図５は図１と同一の構成であり、図１は図５からコンデンサＣを省略した図であり、また図１及び図５には図４に示した抵抗１３，１４は図示を省略している。

【００２９】次に図２は、本実施の形態による２次元垂直共振型半導体レーザ発光装置の所定の垂直共振型半導体レーザ素子ＬＤに発光強度に応じた電位を予め設定するための光量設定電圧印加部５－１～５－ｎの構成例である。図２において、Ｄ／Ａ変換部７は、図示しないコントローラよりデジタルで与えられる８ｂｉｔの光量設定データを、アナログ値に変換してバッファ部８に送る。この光量設定データのｂｉｔ数は８ｂｉｔである必要はなく、用途に応じて変更できる。また、この光量設定データがコントローラよりアナログで与えられる場合は、このＤ／Ａ変換部７は省略することができ、光量設定データをバッファ部８に直接接続すればよい。

【００３０】バッファ部８は、Ｄ／Ａ変換部７の出力を受けて光量設定電圧を出力する。バッファ部８の主な役割は、次段に接続する図１の垂直共振型２次元半導体レーザアレイを駆動するのに十分なドライブ容量を確保することである。バッファ部８は、通常ＯＰアンプ等のドライブ容量の大きい増幅器で構成できるが、トランジスタや抵抗器などのディスクリート部品でも構成可能である。また例えば、Ｄ／Ａ変換部７の出力電圧範囲が０～１Ｖ、光量設定電圧として必要な電圧範囲が０～１２Ｖで、電圧範囲が不整合の場合は、バッファ部８の増幅率を１倍ではなく、例えば１２倍などとすることにより解決できる。

【００３１】次に図３は、本実施の形態における垂直共振型半導体レーザ素子ＬＤの発光タイミングを指示するためのレーザ駆動パルス電圧を発生するレーザ駆動電圧印加部４の構成例である。図３において、バッファ部１０は図示しないコントローラより与えられる発光タイミングを、発光タイミング電圧パルスに変換してレーザ駆動パルス電圧として出力する。バッファ部１０の主な役目は、次段に接続する図１の垂直共振型２次元半導体レーザアレイを駆動するのに十分なドライブ容量を確保することと、発光タイミングが通常ロジックＩＣから出力されるため（電圧レベルがＴＴＬレベルやＥＣＬレベルである）、レーザ駆動パルス電圧として必要な電圧範囲（例えば０～１２Ｖ）に変換することの２つがある。バッファ部１０はバッファ部８と同様、ＯＰアンプ等のドライブ容量の大きい増幅器で構成できるが、トランジスタや抵抗器などのディスクリート部品でも構成可能である。

【００３２】本実施の形態による２次元垂直共振型半導体レーザアレイ発光装置は上記のように構成されており、次にその駆動方法について説明する。図５において、レーザ駆動電圧印加部４が発光を指示する電位をアノード電極に出力するのに先立って、行配線３に接続された光量設定電圧印加部５が、当該行配線３に接続されたアノード電極に対して発光強度に応じた電位を予め設定し、続いてアノード電極に接続された列配線２に接続された、発光タイミングを指示するためのレーザ駆動パルス電圧を発生するレーザ駆動電圧印加部４が、発光を指示するレーザ駆動電圧レベルで列配線２に電圧を印加する。この図５に示した構成で垂直共振型２次元半導体レーザアレイを駆動した例を図６及び図７に示す。

【００３３】図６及び図７は、アナログ電気回路の標準的なシミュレータを用いて、図５に示した構成で垂直共振型２次元半導体レーザアレイを駆動したときの垂直共振型半導体レーザ素子ＬＤ（１，１）～ＬＤ（ｎ，ｍ）に流れる電流を求めた結果を示している。図６（ａ）はレーザ駆動電圧印加部４－１の発生する電位を示し、図６（ｂ）はレーザ駆動電圧印加部４－２～４－ｍの発生する電位を示している。また、図６（ｃ）は光量設定電圧印加部５－１の発生する電位を示し、図６（ｄ）は光量設定電圧印加部５－２～５－ｍの発生する電位を示している。そして図７（ａ）は垂直共振型半導体レーザ素子ＬＤ（１，１）に流れる電流を示し、図７（ｂ）は垂直共振型半導体レーザ素子ＬＤ（２，１）～ＬＤ（ｎ，１）に流れる電流を示している。図７（ｃ）は垂直共振型半導体レーザ素子ＬＤ（１，２）～ＬＤ（１，ｍ）に流れる電流、図７（ｄ）は垂直共振型半導体レーザ素子ＬＤ（２，２）～ＬＤ（ｎ，ｍ）に流れる電流である。

【００３４】この例では、レーザ駆動電圧印加部４のうち列配線２－１に接続されたレーザ駆動電圧印加部４－１のみにレーザ駆動パルス電圧を与えて選択状態とし、他のレーザ駆動電圧印加部４－２～４－ｍはディセーブルの状態（非選択状態）となるようにレーザ非駆動電圧（０Ｖ）にし、また光量設定電圧印加部５のうち行配線３－１に接続された光量設定電圧印加部５－１のみに光量を設定する設定電位を与えて選択状態とし、他の光量設定電圧印加部５－２～５－ｎはディセーブルの状態（非選択状態）となるように非発光設定電圧（１２Ｖ）とすることにより、図５の垂直共振型半導体レーザ素子ＬＤ（１，１）のみを所望のタイミングでパルス発光させ、他の垂直共振型半導体レーザ素子ＬＤ（１，２）～ＬＤ（ｎ，ｍ）は常に消灯させせようとしたシミュレーション結果である。

【００３５】図６（ａ）において約１７ｎｓから３８ｎｓの間に、レーザ駆動電圧印加部４－１はレーザ駆動電圧レベル（１２Ｖ）の電圧を行配線３－１に供給し、このとき予め設定されている光量設定電圧（光量設定電圧印加部５－１の発生する電位、図６（ｃ）参照）は０Ｖ（最大光量での発光を指示する電位）であり、図７（ａ）に示すように垂直共振型半導体レーザ素子ＬＤ（１，１）には１４ｍＡ程度のパルス電流が流れる。垂直共振型２次元半導体レーザアレイのレーザ発光の閾値

電流を図７（ａ）～（ｄ）に補助線で図示した３ｍＡとすると、垂直共振型半導体レーザ素子ＬＤ（１，１）はレーザ発光し、しかもレーザ駆動電圧印加部４－１の発生するレーザ駆動パルス電圧に極めて優れた応答特性を示し、高速駆動ができる。またこのとき垂直共振型半導体レーザ素子ＬＤ（１，１）はこの系での最大光量を発生している。

【００３６】次にレーザ駆動電圧印加部４－１は、約５８ｎｓ～７９ｎｓ間に再び１２Ｖのレーザ駆動パルス電圧を行配線３－１に供給している（図６（ａ）参照）が、予め設定されている光量設定電圧（光量設定電圧印加部５－１の発生する電位、図６（ｃ）参照）は１２Ｖ（消灯を指示する電位）であり、図７（ａ）に示すように垂直共振型半導体レーザ素子ＬＤ（１，１）には数ｎｓ程度の微小パルス電流しか流れず、これはレーザ発光の閾値３ｍＡを越えないため、垂直共振型半導体レーザ素子ＬＤ（１，１）は発光しない。

【００３７】次にレーザ駆動電圧印加部４－１は、約９７ｎｓ～１１９ｎｓ間に再び１２Ｖのレーザ駆動パルス電圧を行配線３－１に供給している（図６（ａ））が、予め設定されている光量設定電圧（光量設定電圧印加部５－１の発生する電位、図６（ｃ）参照）は２Ｖ（最大光量より少し小さい光量を指示する電位）であり、図７（ａ）に示すように垂直共振型半導体レーザ素子ＬＤ（１，１）には１１ｍＡ程度のパルス電流が流れる。これはレーザ発光の閾値３ｍＡを越え、垂直共振型半導体レーザ素子ＬＤ（１，１）はレーザ発光するが、先の発光強度よりは小さくなっている。

【００３８】さて、これらの３回のパルス駆動に当たり垂直共振型半導体レーザ素子ＬＤ（１，１）以外の垂直共振型半導体レーザ素子は、図７（ｂ）～（ｄ）に示したようにレーザ発光に至るような電流は流れず、従って図１１（ａ）～（ｂ）で発生したような異常な発光はない。これは、発光しない垂直共振型半導体レーザ素子に対しては、そのアノード電極の電位がカソード電極の電位よりも低くなるように構成したことにより実現している。

【００３９】このように、本実施の形態によれば、非発光タイミングにおける半導体レーザ素子の異常発光を防止し、発光強度のコントロールが可能になるため、マトリクス配線の垂直共振型半導体レーザ装置の駆動が可能となり、プリンタや通信機器、ディスプレイ、光記憶装置などに組み込んで使用することが可能となる。

【００４０】本発明は、上記実施の形態に限らず種々の変形が可能である。例えば、上記実施の形態においては、垂直共振型半導体レーザ素子ＬＤのカソード電極が行配線３に接続され、アノード電極が列配線２に接続され、且つ、光量設定電圧印加部５からの電圧はカソード電極に印加され、レーザ駆動電圧印加部４からの電圧はアノード電極に印加される構成で説明したが本発明はこれに限られない。垂直共振型半導体レーザ素子ＬＤのアノード電極が行配線３に接続され、カソード電極が列配線２に接続され、且つ、光量設定電圧印加部５からの電圧はカソード電極に印加され、レーザ駆動電圧印加部４からの電圧はアノード電極に印加される構成でもよい。また、垂直共振型半導体レーザ素子ＬＤのカソード電極が行配線３に接続され、アノード電極が列配線２に接続され、且つ、光量設定電圧印加部５からの電圧はアノード電極に印加され、レーザ駆動電圧印加部４からの電圧はカソード電極に印加される構成でもよいし、垂直共振型半導体レーザ素子ＬＤのアノード電極が行配線３に接続され、カソード電極が列配線２に接続され、且つ、光量設定電圧印加部５からの電圧はアノード電極に印加され、レーザ駆動電圧印加部４からの電圧はカソード電極に印加される構成でもよい。いずれの構成を用いても、カソード電位がアノード電位とほぼ等しいか高くなるように、レーザ駆動電圧印加部４と光量設定電圧印加部５からの出力電圧のレベルを調整しておけばよい。

【００４１】

【発明の効果】以上の通り、本発明によれば、非発光タイミングにおける半導体レーザ素子の異常発光を防止し、発光強度の制御が可能になるため、マトリクス配線の垂直共振型半導体レーザ装置の駆動が可能となり、プリンタや通信機器、ディスプレイ、光記憶装置などに組み込んで使用することが可能となる。

【図面の簡単な説明】

【図１】本発明の実施の形態による垂直共振型２次元半導体レーザアレイ発光装置の構成を示す図である。

【図２】本実施の形態による垂直共振型２次元半導体レーザアレイ発光装置における、発光強度に応じた電位を予め設定するための光量設定電圧印加部５の構成例を示す図である。

【図３】本実施の形態による垂直共振型２次元半導体レーザアレイ発光装置における、垂直共振型半導体レーザ素子の発光タイミングを指示するためのレーザ駆動電圧印加部４の構成例を示す図である。

【図４】垂直共振型半導体レーザ素子の代表的な等価回路を示す図である。

【図５】本発明の実施の形態による垂直共振型２次元半導体レーザアレイ発光装置の構成を示す図である。

【図６】本発明の実施の形態による垂直共振型２次元半導体レーザアレイ発光装置の駆動方法を説明する図である。

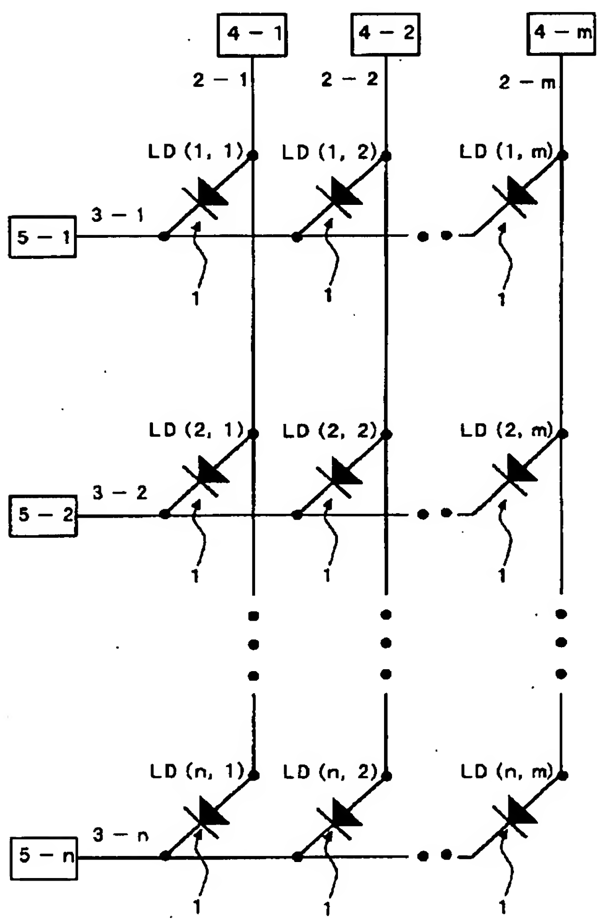
【図７】本発明の実施の形態による垂直共振型２次元半導体レーザアレイ発光装置の駆動方法を説明する図である。

【図８】従来の２次元半導体レーザアレイ発光装置の構成を示す図である。

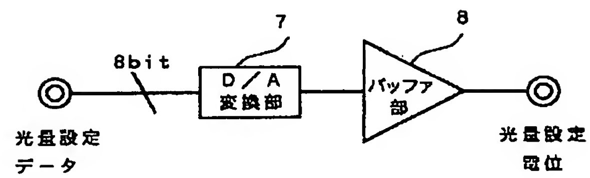
【図９】図８に示した従来の２次元半導体レーザアレイ発光装置の構成を表現し直した図である。

【図１０】従来の２次元半導体レーザアレイ発光装置の駆動方法を説明する図である。
【図１１】従来の２次元半導体レーザアレイ発光装置の駆動方法を説明する図である。
【図１２】水平共振型半導体レーザ素子のＩ－Ｌ特性、Ｉ－Ｖ特性を示す図である。
【図１３】垂直共振型半導体レーザ素子のＩ－Ｌ特性、Ｉ－Ｖ特性を示す図である。
【符号の説明】
1　２次元半導体レーザアレイの形成位置
2　列配線
3　行配線
4　レーザ駆動電圧印加部
5　光量設定電圧印加部
7　Ｄ／Ａ変換部
8、１０　バッファ部
１２　ダイオード
１３、１４　抵抗
１５　コンデンサ
１７　駆動電流パルス発生部
１８　イネーブル電圧発生部

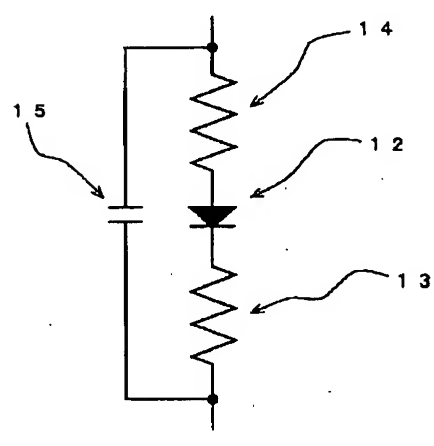
【図１】



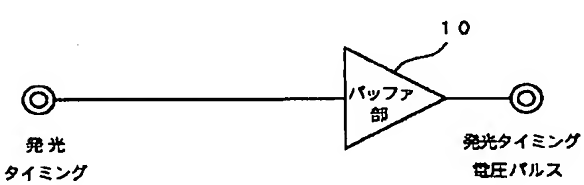
【図２】



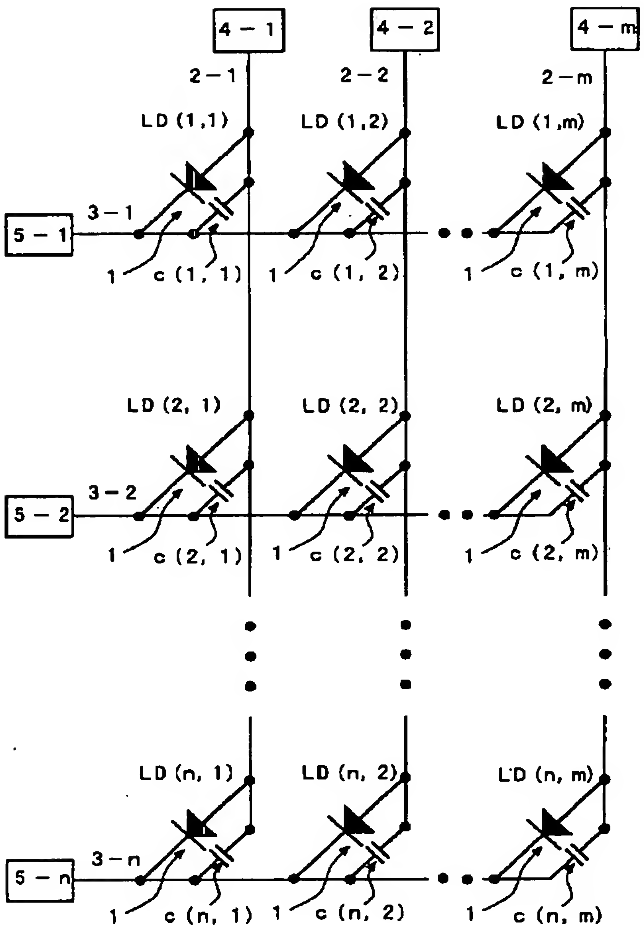
【図４】



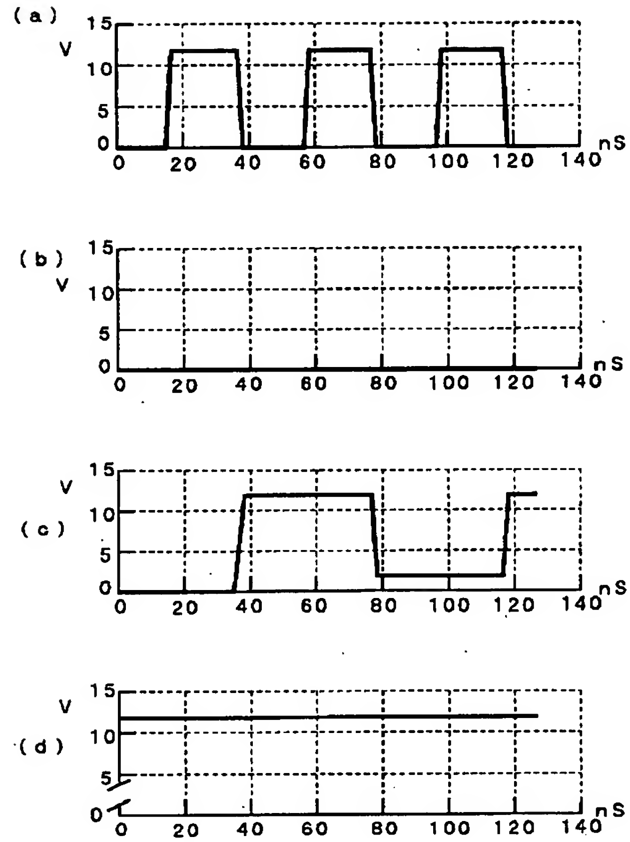
【図３】



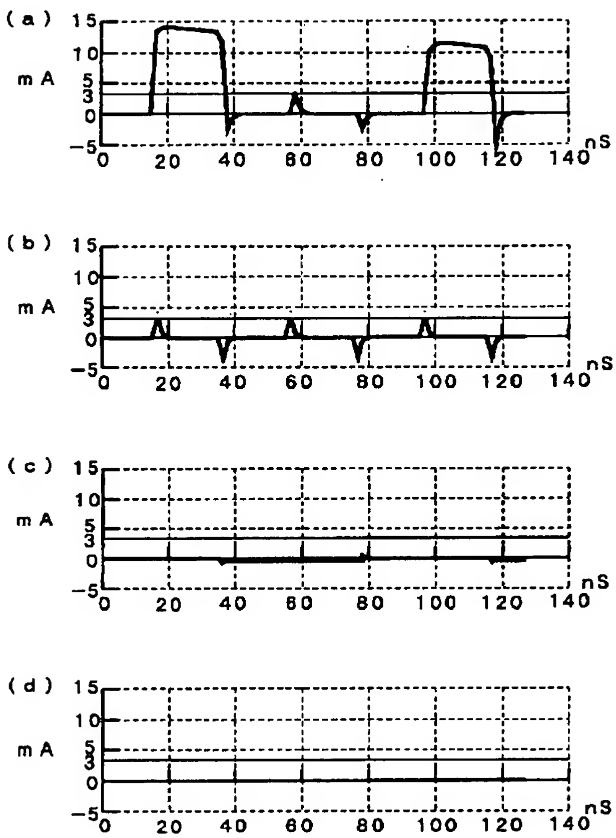
【図5】


4－1
4－2
4－m
2－1
2－2
2－m
LD (1,1)
LD (1,2)
LD (1,m)
3－1
5－1
1
c (1, 1)
c (1, 2)
c (1, m)
LD (2, 1)
LD (2, 2)
LD (2, m)
3－2
5－2
c (2, 1)
c (2, 2)
c (2, m)
LD (n, 1)
LD (n, 2)
LD (n, m)
3－n
5－n
c (n, 1)
c (n, 2)
c (n, m)

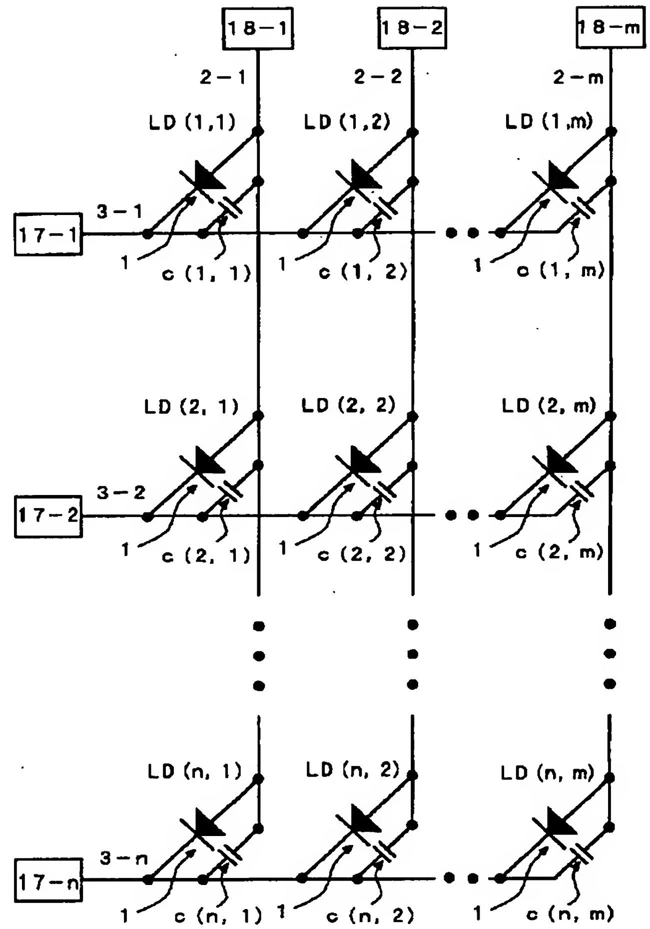
【図6】


(a)
(b)
(c)
(d)
V
15
10
5
0
0
20
40
60
80
100
120
140
nS

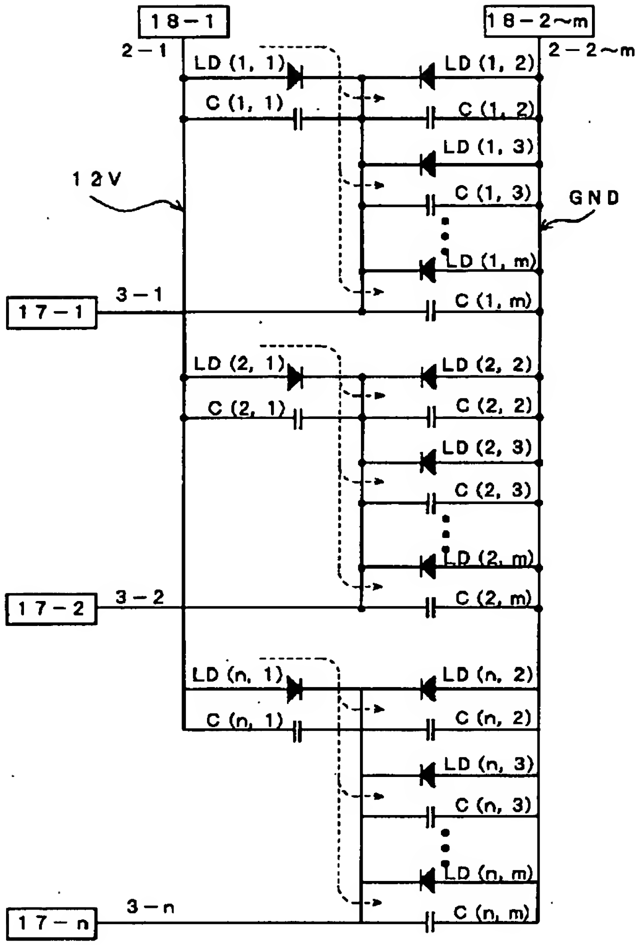
【図7】


(a)
(b)
(c)
(d)
mA
nS
15
10
5
3
0
−5
0
20
40
60
80
100
120
140

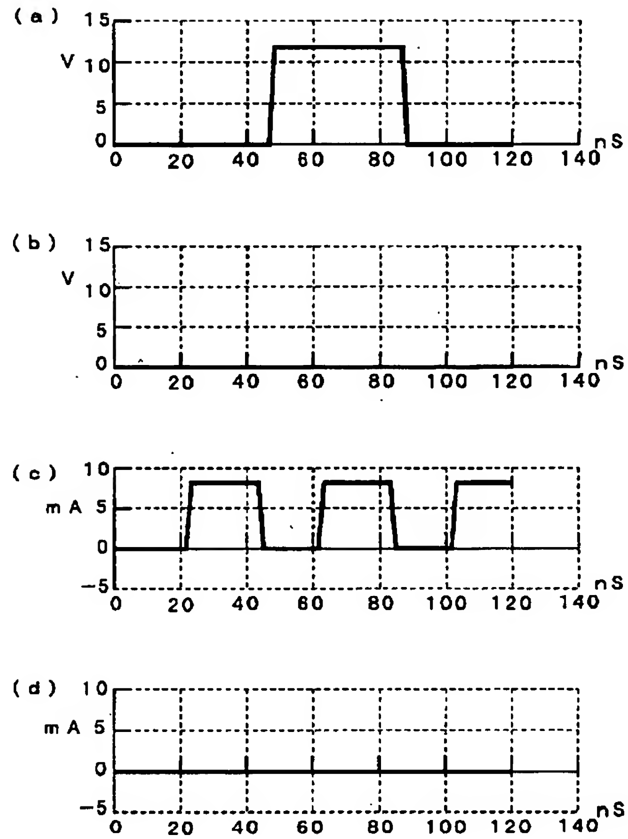
【図8】


18−1
18−2
18−m
2−1
2−2
2−m
LD (1,1)
LD (1,2)
LD (1,m)
17−1
3−1
c (1, 1)
c (1, 2)
c (1, m)
LD (2, 1)
LD (2, 2)
LD (2, m)
17−2
3−2
c (2, 1)
c (2, 2)
c (2, m)
LD (n, 1)
LD (n, 2)
LD (n, m)
17−n
3−n
c (n, 1)
c (n, 2)
c (n, m)
1

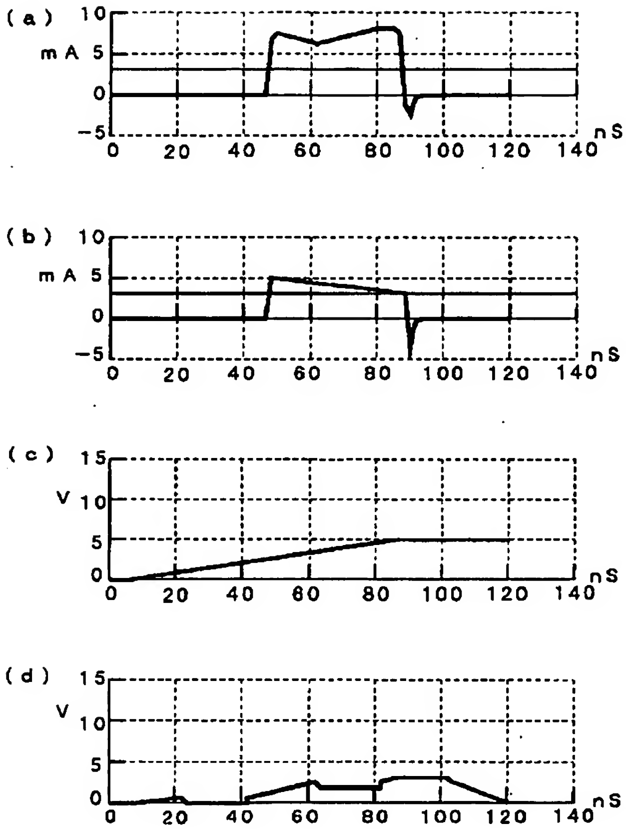
【図９】


18−1
18−2〜m
2−1
2−2〜m
LD (1, 1)
LD (1, 2)
C (1, 1)
C (1, 2)
LD (1, 3)
C (1, 3)
12V
GND
LD (1, m)
C (1, m)
17−1
3−1
LD (2, 1)
LD (2, 2)
C (2, 1)
C (2, 2)
LD (2, 3)
C (2, 3)
LD (2, m)
C (2, m)
17−2
3−2
LD (n, 1)
LD (n, 2)
C (n, 1)
C (n, 2)
LD (n, 3)
C (n, 3)
LD (n, m)
C (n, m)
17−n
3−n

【図１０】

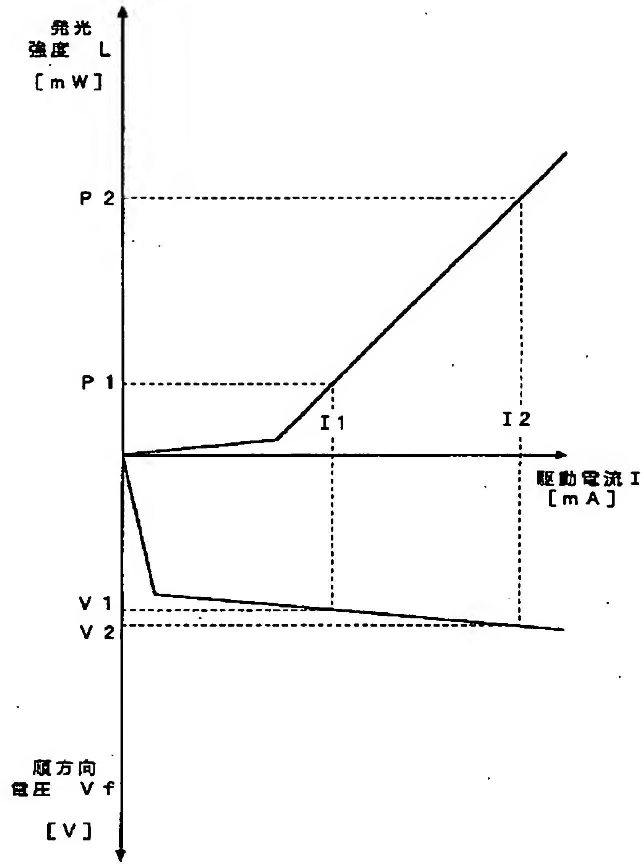

(a)
V
15
10
5
0
0 20 40 60 80 100 120 140
nS
(b)
V
15
10
5
0
0 20 40 60 80 100 120 140
nS
(c)
mA
10
5
0
−5
0 20 40 60 80 100 120 140
nS
(d)
mA
10
5
0
−5
0 20 40 60 80 100 120 140
nS

【図１１】



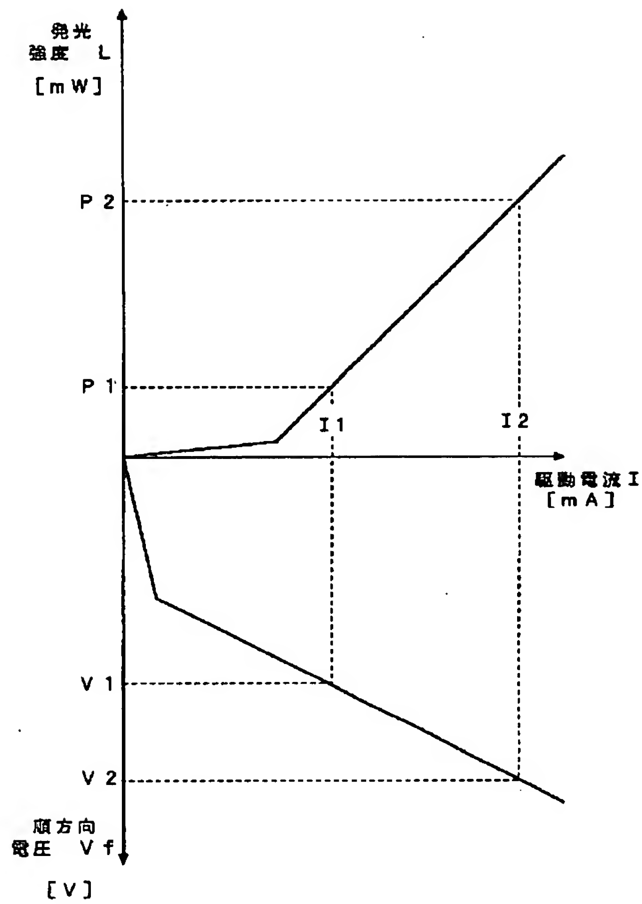
(a)
mA
10
5
0
−5
nS
0
20
40
60
80
100
120
140
(b)
mA
(c)
V
15
(d)

【図１２】



発光
強度 L
[mW]
P2
P1
I1
I2
駆動電流 I
[mA]
V1
V2
順方向
電圧 Vf
[V]

【図１３】



CLAIMS

[Claim(s)]
[Claim 1] Two or more line wiring formed on the substrate, and two or more train wiring formed by intersecting said two or more line wiring, It is formed near [a crossover field] each [of said line wiring and train wiring], respectively, and has the 1st electrode connected to said line wiring, and the 2nd electrode connected to said train wiring. Two or more vertical resonance mold semiconductor laser components which emit light perpendicularly mostly to the substrate side of said substrate, The 1st electrical-potential-difference impression means which impresses the 1st electrical potential difference to selection line wiring chosen from said two or more line wiring, and impresses the 2nd electrical potential difference to non-choosing line wiring, Two-dimensional semiconductor laser array luminescence equipment characterized by having the 2nd electrical-potential-difference impression means which impresses the 3rd electrical potential difference to selection train wiring chosen from said two or more train wiring, and impresses the 4th electrical potential difference to non-choosing train wiring.
[Claim 2] In two-dimensional semiconductor laser array luminescence equipment according to claim 1, said 1st electrode is a cathode electrode and said 2nd electrode is an anode electrode. Said 1st electrical potential difference It is the quantity of light programmed voltage which sets up the luminescence reinforcement of the selected vertical resonance mold semiconductor laser component connected to said selection line wiring and selection train wiring. Said 2nd electrical potential difference It is the nonluminescent programmed voltage which makes nonluminescent vertical resonance mold semiconductor laser components other than said selected vertical resonance mold semiconductor laser component. Said 1st electrical-potential-difference impression means It is a quantity of light programmed-voltage impression means to impress beforehand said quantity of light programmed voltage and a nonluminescent programmed voltage to predetermined line wiring before luminescence of said selected vertical resonance mold semiconductor laser component. Said 3rd electrical potential difference It is the laser driving pulse electrical potential difference which consists of laser non-driver voltage level which directs nonluminescent [which direct luminescence of said selected vertical resonance mold semiconductor laser component / the laser driver voltage level and nonluminescent]. Said 4th electrical potential difference is laser non-driver voltage which directs nonluminescent [of vertical resonance mold semiconductor laser components other than said selected vertical resonance mold semiconductor laser component]. Said 2nd electrical-potential-difference impression means Two-dimensional semiconductor laser array luminescence equipment characterized by being a laser driver voltage impression means to impress said laser driving pulse electrical potential difference and said laser non-driver voltage to predetermined train wiring.
[Claim 3] In two-dimensional semiconductor laser array luminescence equipment according to claim 1, said 1st electrode is an anode electrode and said 2nd electrode is a cathode electrode. Said 1st electrical potential difference It is the laser driving pulse electrical potential difference which consists of laser non-driver voltage level which directs nonluminescent [which direct luminescence of the selected vertical resonance mold semiconductor laser component connected to said selection line wiring and

selection train wiring / the laser driver voltage level and nonluminescent]. Said 2nd electrical potential difference is laser non-driver voltage which directs the nonluminescent timing of vertical resonance mold semiconductor laser components other than said selected vertical resonance mold semiconductor laser component. Said 1st electrical-potential-difference impression means is a laser driver voltage impression means to impress said laser driving pulse electrical potential difference and said laser non-driver voltage to predetermined line wiring. Said 3rd electrical potential difference It is the quantity of light programmed voltage which sets up the luminescence reinforcement of said selected vertical resonance mold semiconductor laser component. Said 4th electrical potential difference It is the nonluminescent programmed voltage which makes nonluminescent vertical resonance mold semiconductor laser components other than said selected vertical resonance mold semiconductor laser component. Said 2nd electrical-potential-difference impression means Two-dimensional semiconductor laser array luminescence equipment characterized by being a quantity of light programmed-voltage impression means to impress beforehand said quantity of light programmed voltage and a nonluminescent programmed voltage to predetermined train wiring before luminescence of said selected vertical resonance mold semiconductor laser component.

[Claim 4] In two-dimensional semiconductor laser array luminescence equipment according to claim 1, said 1st electrode is a cathode electrode and said 2nd electrode is an anode electrode. Said 1st electrical potential difference It is the laser driving pulse electrical potential difference which consists of laser non-driver voltage level which directs nonluminescent [which direct luminescence of the selected vertical resonance mold semiconductor laser component connected to said selection line wiring and selection train wiring / the laser driver voltage level and nonluminescent]. Said 2nd electrical potential difference is laser non-driver voltage which directs the nonluminescent timing of vertical resonance mold semiconductor laser components other than said selected vertical resonance mold semiconductor laser component. Said 1st electrical-potential-difference impression means is a laser driver voltage impression means to impress said laser driving pulse electrical potential difference and said laser non-driver voltage to predetermined line wiring. Said 3rd electrical potential difference It is the quantity of light programmed voltage which sets up the luminescence reinforcement of said selected vertical resonance mold semiconductor laser component. Said 4th electrical potential difference It is the nonluminescent programmed voltage which makes nonluminescent vertical resonance mold semiconductor laser components other than said selected vertical resonance mold semiconductor laser component. Said 2nd electrical-potential-difference impression means Two-dimensional semiconductor laser array luminescence equipment characterized by being a quantity of light programmed-voltage impression means to impress beforehand said quantity of light programmed voltage and a nonluminescent programmed voltage to predetermined train wiring before luminescence of said selected vertical resonance mold semiconductor laser component.

[Claim 5] In two-dimensional semiconductor laser array luminescence equipment according to claim 1, said 1st electrode is an anode electrode and said 2nd electrode is a cathode electrode. Said 1st electrical potential difference It is the quantity of light programmed voltage which sets up the luminescence reinforcement of the selected vertical resonance mold semiconductor laser component connected to said selection line wiring and selection train wiring. Said 2nd electrical potential difference It is the nonluminescent programmed voltage which makes nonluminescent vertical resonance mold semiconductor laser components other than said selected vertical resonance mold semiconductor laser component. Said 1st electrical-potential-difference impression means It is a quantity of light programmed-voltage impression means to impress beforehand said quantity of light programmed voltage and a nonluminescent programmed voltage to predetermined line wiring before luminescence of said selected vertical resonance mold semiconductor laser component. Said 3rd electrical potential difference It is the laser driving pulse electrical potential difference which consists of laser non-driver voltage level which directs nonluminescent [which direct luminescence of said selected vertical resonance mold semiconductor laser component / the laser driver voltage level and nonluminescent]. Said 4th electrical potential difference is laser non-driver voltage which directs the nonluminescent timing of vertical resonance mold semiconductor laser components other than said selected vertical

resonance mold semiconductor laser component. Said 2nd electrical-potential-difference impression means is two-dimensional semiconductor laser array luminescence equipment characterized by being a laser driver voltage impression means to impress said laser driving pulse electrical potential difference and said laser non-driver voltage to predetermined train wiring.
[Claim 6] It is two-dimensional semiconductor laser array luminescence equipment characterized by the voltage level of said nonluminescent programmed voltage being almost equal to the laser driver voltage level of said laser driving pulse electrical potential difference, or it being higher than it and said quantity of light programmed voltage being almost equal to the laser non-driver voltage level of said laser driving pulse electrical potential difference in two-dimensional semiconductor laser array luminescence equipment according to claim 2 or 3, or being higher than it.
[Claim 7] It is two-dimensional semiconductor laser array luminescence equipment characterized by the voltage level of said nonluminescent programmed voltage being almost equal to the voltage level which lengthened the threshold voltage of laser from the laser driver voltage level of said laser driving pulse electrical potential difference in two-dimensional semiconductor laser array luminescence equipment according to claim 2 or 3, or it being higher than it and said quantity of light programmed voltage being almost equal to the voltage level which lengthened the threshold voltage of laser from the laser non-driver voltage level of said laser driving pulse electrical potential difference, or being higher than it.
[Claim 8] It is two-dimensional semiconductor laser array luminescence equipment characterized by the voltage level of said nonluminescent programmed voltage being almost equal to the laser driver voltage level of said laser driving pulse electrical potential difference, or it being lower than it and said quantity of light programmed voltage being almost equal to the laser non-driver voltage level of said laser driving pulse electrical potential difference in two-dimensional semiconductor laser array luminescence equipment according to claim 4 or 5, or being lower than it.
[Claim 9] It is two-dimensional semiconductor laser array luminescence equipment characterized by the voltage level of said nonluminescent programmed voltage being almost equal to the voltage level which lengthened the threshold voltage of laser from the laser driver voltage level of said laser driving pulse electrical potential difference in two-dimensional semiconductor laser array luminescence equipment according to claim 4 or 5, or it being lower than it and said quantity of light programmed voltage being almost equal to the voltage level which lengthened the threshold voltage of laser from the laser non-driver voltage level of said laser driving pulse electrical potential difference, or being lower than it.
[Claim 10] The actuation approach of the two-dimensional semiconductor-laser array luminescence equipment characterized by making it whether it is almost equal to the potential of said anode electrode , and the potential of said cathode electrode in a nonluminescent condition become from it to the vertical resonance mold semiconductor-laser component which has the anode electrode connected with the cathode electrode which was formed in the crossover field of two or more line wiring and train wiring , respectively , and was connected to either line wiring or train wiring on another side .

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the two-dimensional semiconductor laser array luminescence equipment which has arranged the vertical resonance mold semiconductor laser component to each crossover field of two or more line wiring and two or more train wiring, and its actuation approach.
[0002]
[Description of the Prior Art] Conventionally, a semiconductor laser component is formed near [a crossover field] each [of two or more line wiring on a substrate, and two or more train wiring], and JP,2-198184,A, JP,7-86691,A, etc. have disclosure as semiconductor laser array luminescence equipment which carries out two-dimensional (field) luminescence by the semiconductor laser array arranged in the shape of a matrix. The two-dimensional semiconductor laser array indicated by JP,2-198184,A forms the vertical resonance mold semiconductor laser component by which the laser cavity end face was perpendicularly formed to the substrate side in the shape of a matrix by forming the current block layer of a half-insulator layer in a component formation field, adding the impurity of an anti-conductivity type [section / by the side of a substrate / request / substrate], forming a component isolation region, and forming a cathode electrode and an anode electrode further at the vertical section, respectively. Moreover, the two-dimensional semiconductor laser array indicated by JP,7-86691,A arranges the surface emission-type laser component of a level resonance mold to an insulating substrate two-dimensional, is extended in the direction of cavity length of each surface emission-type laser component, forms a lower layer electrode in the shape of a line, prepares the electrode insulation section for every line, and has the composition of having prepared the upper electrode in the line-like pattern which intersects perpendicularly with a lower layer electrode.
[0003] The laser actuation approach of making the above two-dimensional semiconductor laser arrays emitting light is explained below. The laser actuation approach in the semiconductor laser component and 1-dimensional semiconductor laser array of a simple substance which are not arranged introduction and in the shape of a matrix is explained. Generally making the semiconductor laser component or 1-dimensional semiconductor laser array of these simple substances drive using constant current or a current pulse is performed. Moreover, when it is going to change laser luminescence reinforcement, as the light guide of a part of laser beam is carried out to a photosensor, the closed loop of negative feedback is constituted so that a reference value may become equal about the output of a photosensor, and the value of constant current or a current pulse is adjusted, laser luminescence reinforcement is controlled.
[0004] Thus, laser oscillation arises according to the current by which to use constant current or a current pulse for actuation of a semiconductor laser component was set to the 1st, and the constriction of the semiconductor laser component was carried out to the luminescence field, and laser intensity is based on the principle of operation of the semiconductor laser component of having the property proportional to the amount of currents. The level resonance mold semiconductor laser component is

conventionally used [2nd] for the semiconductor laser component or the 1-dimensional semiconductor laser array, and actuation by constant current or the current pulse is performed based on the operating characteristic.

[0005] The current-electrical-potential-difference (I-V) property of a level resonance mold semiconductor laser component, and a current / luminescence property on the strength (I-L) are shown in drawing 12 . The inclination of the curve which shows the I-L property of a level resonance mold semiconductor laser component in drawing 12 is 0.5-1.0. mW/mA The inclination of the curve which shows an I-V property is 0.01 to being extent. V/mA It is extent. The case where luminescence reinforcement is controlled by resolution of 8 bits for between the luminescence reinforcement P1-P2 in drawing 12 is considered. If a current is chosen as a controlling factor of luminescence reinforcement at this time, since what is necessary is just to control the large area of the actuation currents I1-I2 of drawing 12 by resolution of 8 bits, control of luminescence reinforcement is easy. However, although the very narrow range of the electrical potential differences V1-V2 of drawing 12 must be controlled by resolution of 8 bits if an electrical potential difference is chosen as a controlling factor of luminescence reinforcement, implementation of the control unit which can control such narrow electrical-potential-difference range of 8 bits by resolution is difficult. Moreover, in such a short range, it may also arise that that the feeble noise mixed will also separate from the range of the desired luminescence reinforcement P1-P2 greatly, and a component will be destroyed.

[0006] It was common to have performed actuation and control of luminescence reinforcement for the above reason by controlling a current by the semiconductor laser component and 1-dimensional semiconductor laser array of a level resonance mold. On the other hand, in the case of the vertical resonance mold semiconductor laser component, as shown in drawing 13 , the current-electrical-potential-difference (I-V) property is superior to the level resonance mold semiconductor laser component, and it is possible to carry out electrical-potential-difference actuation. The inclination of the curve which shows the I-V property of a vertical resonance mold semiconductor laser component as shown in drawing 13 is 0.5. It is about V/mA. 0.01 of the level resonance mold semiconductor laser component of drawing 12 It compares with about V/mA. For example, even when controlling between the luminescence reinforcement P1-P2 by resolution of 8 bits, since what is necessary is just to be able to control the electrical potential difference of the comparatively large range of V1-V2 by resolution of 8 bits, it has the possibility of electrical-potential-difference actuation fundamentally. However, since the vertical resonance mold semiconductor laser component has the same I-L property as a level resonance mold semiconductor laser component, if it is actuation by the low frequency pulse, the actuation method by current control is adopted chiefly.

[0007] Now, the case where pulse actuation is carried out by the current pulse the same with having driven an above-mentioned semiconductor laser component and an above-mentioned 1-dimensional semiconductor laser array about the two-dimensional semiconductor laser array which consists of semiconductor laser components of the level resonance mold arranged in the shape of a matrix near [a crossover field] each [of two or more line wiring on a substrate and two or more train wiring] or a vertical resonance mold is explained.

[0008] The structure of a two-dimensional semiconductor laser array is shown in drawing 8 . In drawing 8 , the line wiring 3 extended to two or more line writing directions is formed on a substrate, and the train wiring 3 which intersects perpendicularly to line wiring through an insulator layer is formed. A suffix (-1, -2 grade) is given to each line wiring 3 and the train wiring 2, and each wiring is distinguished and shown. A two-dimensional semiconductor laser array is formed in the crossover field of two or more line wiring 3 and the train wiring 2 as the number 1 in drawing shows, and it has two or more semiconductor laser components LD arranged in the shape of [of a n line xm train] a matrix. The suffix (n, m) is given to the semiconductor laser component LD in drawing. The enabling electrical-potential-difference generating section 18 which one train of the arbitration of the train wiring 2 is chosen [section], and makes the selected train wiring 2 generate an enabling electrical potential difference is formed in the end section of the train wiring 2. The actuation current pulse generating section 17 which generates the current pulse for directing the luminescence reinforcement and

luminescence timing of a semiconductor laser component on the selected train wiring 2 is formed in the end section of the line wiring 3. The suffix (-1, -2 grade) corresponding to each wiring is attached, and is distinguished and shown also in the ****** enabling electrical-potential-difference generating section 18 and the actuation current pulse generating section 17.

[0009] A current is supplied from the actuation current pulse generating section 17-1 by which the cathode electrode was connected to the line wiring 3-1 of n - 3-n, respectively, and the semiconductor laser components LD (1 1)-LD (n, m) of the two-dimensional semiconductor laser array of a n line xm train were connected to the line wiring 3-1 - 3-n, respectively - 17-n. Moreover, an electrical potential difference is impressed to each anode electrode from the enabling electrical-potential-difference generating section 18-1 which was connected to the train wiring 2-1 of m - 2-n, and was connected to the train wiring 2-1 - 2-n, respectively - 18-n. Moreover, the electrostatic capacity generated to each crossover field of line wiring shown by the number 1 in drawing and train wiring is shown as C (1 1)-C (n, m).

[0010] Next, the result of having searched for the current which flows for the semiconductor laser components LD (1 1)-LD (n, m) when driving a two-dimensional semiconductor laser array about the two-dimensional semiconductor laser array of such a configuration using the standard simulator of an analog electrical circuit is explained using drawing 10 and 11. Drawing 10 (a) shows the potential which the enabling electrical-potential-difference generating section 18-1 generates, and drawing 10 (b) shows the potential which the enabling electrical-potential-difference generating section 18-2 - 18-m generate. Drawing 10 (c) shows the current pulse which the current pulse generating section 17-1 generates, and drawing 10 (d) shows the current which the current pulse generating section 17-2 - 17-n generate. The current to which drawing 11 (a) flows for the semiconductor laser component LD (1 1), the current to which drawing 11 (b) flows for the semiconductor laser components LD (2 1)-LD (n, 1), and drawing 11 (c) show the potential of the line wiring 3-1, and drawing 11 (d) shows the potential of the line wiring 3-2 - 3-n.

[0011] In this example of simulation, only the train wiring 2-1 is chosen by giving enabling potential (12V) only to the enabling electrical-potential-difference generating section 18-1 connected to the train wiring 2-1 among the enabling electrical-potential-difference generating sections 18, and giving disabling potential (0V) to the enabling electrical-potential-difference generating section 18-2 of other train wiring 2-2 - 2-m - 18-m (refer to drawing 10 (a) and (b)). Moreover, an actuation current pulse is given only to the current pulse generating section 17-1 connected to the line wiring 3-1 among the current pulse generating sections 17, and the current pulse generating section 17-2 connected to other line wiring 17-2 - n - 17-n make the actuation current zero (refer to drawing 10 (c) and (d)). That is, in this example of simulation, pulse luminescence is carried out to the timing of a request of the semiconductor laser component LD in drawing 8 (1 1), and other semiconductor laser components LD (1 2)-LD (n, m) are as a result of [at the time of making it drive so that the light may be made to always put out] simulation.

[0012] In drawing 10 (c) which shows the current pulse which the actuation current pulse generating section 17-1 generates, although the current pulse generating section 17-1 supplies 8mA pulse current to the line wiring 3-1 from about 21 to 43ns At this time, the enabling electrical-potential-difference generating section 18-1 is that which is not enabling potential (that is, it is disabling potential). As shown in drawing 11 (a) which shows the current which flows for the semiconductor laser component LD, and (b), the normal condition that a current does not flow for all the semiconductor laser components LD (1 1)-LD (n, 1) of the selected train wiring 2-1, therefore there is also no laser luminescence is maintained. However, situations differed to the pulse current which the current pulse generating section 17-1 for about 61ns - 83ns generates, and as shown in drawing 11 (a) and (b), the semiconductor laser components LD (1 1)-LD (n, 1) have carried out abnormality luminescence.

[0013] It doubles at the event of about 45ns when the enabling electrical-potential-difference generating section 18-1 becomes enabling potential in drawing 10 (a). An unjust current begins (refer to drawing 11 (a)) to flow for the semiconductor laser component LD (1 1). About 83ns or subsequent ones when the current pulse generating section 17-1 finished supplying pulse current like drawing 10 (c) continues, and

this unjust current continues till the event (refer to drawing 10 (a)) of about 87ns when the enabling electrical-potential-difference generating section 18-1 returns to disabling potential. If the threshold current of laser luminescence of the two-dimensional semiconductor laser array shown in drawing 11 (a) and (b) as an auxiliary conductor is set to 3mA, this unjust current will exceed a threshold and the semiconductor laser component LD (1 1) will carry out laser luminescence to the timing which is not meant. Furthermore, at this time, an unjust current flows also for the semiconductor laser components LD (2 1)-LD (n, 1) to which the actuation current should not be supplied at all from the current pulse generating section 17 (refer to drawing 11 (b)), and abnormality luminescence is carried out exceeding the threshold of laser luminescence.

[0014]

[Problem(s) to be Solved by the Invention] It will be because it becomes what cannot disregard existence of the electrostatic capacity during matrix wiring (C (1 1)-C (n, m) of drawing 8) that these unjust currents pose a problem, if pulse actuation of the semiconductor laser component tends to be carried out on the high frequency of nanosecond order. The enabling electrical-potential-difference generating section 18-1 explains the reason of this unjust current generating using drawing 9 about the case where enabling, and 18-2 - 18-m are disabling. In order that drawing 9 may make an understanding easy, the configuration of a two-dimensional semiconductor laser array shown in drawing 8 is reexpressed, and there is no different point from the configuration of drawing 8 . In drawing 9 , as the broken line with an arrow head showed, a current flows to electrostatic capacity C (1 2)-C (1 m) through the semiconductor laser component LD (1 1) at the flash when the enabling electrical-potential-difference generating section 18-1 became enabling potential (12V). Moreover, a current flows to electrostatic capacity C (2 2)-C (2 m) through the semiconductor laser component LD (2 1) similarly, a current flows to electrostatic capacity C (n, 2)-C (n, m) through the semiconductor laser component LD (n, 1), and this causes an unjust current. Moreover, potential rises with are recording of a charge, and electrostatic capacity C (1 2)-C (1 m), electrostatic capacity C (2 2)-C (2 m), and electrostatic capacity C (n, 2)-C (n, m) are shown in drawing 11 (c) and (d), and show potential change [like].

[0015] The unjust current which flows for such a semiconductor laser component LD It is added to the actuation current which the actuation current pulse generating section 17 generates, and the semiconductor laser components LD (1 1)-LD (n, 1) are supplied. Since the current value changes depending on the charge accumulated in electrostatic capacity C (1 2)-C (1 m), electrostatic capacity C (2 2)-C (2 m), and electrostatic capacity C (n, 2)-C (n, m), It also makes it very difficult to change every moment, therefore to control the luminescence reinforcement of the semiconductor laser component LD. Thus, if the conventional actuation approach of driving a semiconductor laser component by the current pulse is applied to two-dimensional semiconductor laser array luminescence equipment, with the electrostatic capacity generated in a part for the intersection of the above lines and train wiring, abnormality luminescence of a semiconductor laser component occurs to nonluminescent timing, and it has the problem that control of luminescence reinforcement becomes impossible further.

[0016] Moreover, SPIE According to the actuation approach about the two-dimensional semiconductor laser array of Proceedings, Vol.2147, and matrix wiring indicated by P.9, if a two-dimensional semiconductor laser array is replaced with the conventional current actuation and electrical-potential-difference actuation is carried out, it is cheaper than current actuation, and it is indicated that it can drive to stability more depending on conditions. However, the practical and concrete driving gear and the actuation approach (actuation procedure) are not indicated at all on the assumption that existence of the electrostatic capacity by matrix wiring.

[0017] The object of this invention is to offer the two-dimensional semiconductor laser array luminescence equipment which does not produce the unjust current which originates in the electrostatic capacity produced near [a crossover field] each [of two or more line wiring and two or more train wiring], and flows to a semiconductor laser component, and its actuation approach. Moreover, this invention prevents abnormality luminescence of a semiconductor laser component, and is to offer two-dimensional semiconductor laser array luminescence equipment excellent in the controllability of luminescence reinforcement, and its actuation approach.

[0018]
[Means for Solving the Problem] Then, as a result of repeating research wholeheartedly about the approach of carrying out pulse actuation of the two-dimensional semiconductor laser array of matrix wiring, controlling luminescence reinforcement, this invention persons impressed quantity of light setting-out potential to line wiring (or train wiring) about the two-dimensional semiconductor laser array of a vertical resonance mold, and reached a header and this invention in the actuation approach of adding a luminescence timing electrical-potential-difference pulse to train wiring (or line wiring). Namely, two or more train wiring formed by the above-mentioned object intersecting two or more line wiring formed on the substrate, and two or more line wiring, Two or more vertical resonance mold semiconductor laser components which are formed near [a crossover field] each [of line wiring and train wiring], respectively, have the 1st electrode connected to line wiring, and the 2nd electrode connected to train wiring, and emit light perpendicularly mostly to the substrate side of a substrate, The 1st electrical-potential-difference impression means which impresses the 1st electrical potential difference to selection line wiring chosen from two or more line wiring, and impresses the 2nd electrical potential difference to non-choosing line wiring, It is attained by two-dimensional semiconductor laser array luminescence equipment equipped with the 2nd electrical-potential-difference impression means which impresses the 3rd electrical potential difference to selection train wiring chosen from two or more train wiring, and impresses the 4th electrical potential difference to non-choosing train wiring.
[0019] If it matches and explains to drawing 1 which expresses the gestalt of 1 operation more concretely and drawing 6 , and drawing 7 Two or more train wiring formed by intersecting two or more line wiring (3-1 - 3-n) and them (2-1 - 2-m), It is formed in each about one crossover field of line wiring (3-1 - 3-n) and train wiring (2-1 - 2-m), respectively. It has the 1st electrode (cathode electrode) connected to line wiring (3-1 - 3-n), and the 2nd electrode (anode electrode) connected to train wiring (2-1 - 2-m). Two or more vertical resonance mold semiconductor laser components which emit light perpendicularly mostly to the substrate side of a substrate (LD (1 1)-LD (n, m)), The quantity of light programmed voltage (0V-12V) which was chosen from two or more line wiring (3-1 - 3-n) and which sets up the luminescence reinforcement of a vertical resonance mold semiconductor laser component (LD (1 1)) as the 1st electrical potential difference, for example to selection line wiring (3-1) is impressed. As 1st electrical-potential-difference impression means which impresses the nonluminescent programmed voltage (12V) which makes nonluminescent vertical resonance mold semiconductor laser components other than the vertical resonance mold semiconductor laser component chosen as the 2nd electrical potential difference to non-choosing line wiring A quantity of light programmed-voltage impression means to impress beforehand a quantity of light programmed voltage and a nonluminescent programmed voltage to predetermined line wiring (3-1 - 3-n) before luminescence of the selected vertical resonance mold semiconductor laser component (LD (1 1)) (5-1 - 5-n), As opposed to for example, selection train wiring (2-1) chosen from two or more train wiring (2-1 - 2-m) The laser driving pulse electrical potential difference (refer to drawing 6 (a)) which consists of laser non-driver voltage level (0V) which directs nonluminescent [which direct luminescence of the vertical resonance mold semiconductor laser component chosen as the 3rd electrical potential difference / the laser driver voltage level (12V) and nonluminescent] is impressed. As 2nd electrical-potential-difference impression means which impresses the laser non-driver voltage (0V) which directs nonluminescent [of vertical resonance mold semiconductor laser components other than the vertical resonance mold semiconductor laser component chosen as the 4th electrical potential difference to non-choosing train wiring] The above-mentioned object is attained by two-dimensional semiconductor laser array luminescence equipment equipped with a laser driver voltage impression means (4-1 - 4-m) to impress a ** laser driving pulse electrical potential difference (0V and 12V) and laser non-driver voltage (0V) to predetermined train wiring.
[0020] And the above-mentioned object uses the 1st electrode as an anode electrode, and uses the 2nd electrode as a cathode electrode. The 1st electrical potential difference is a laser driving pulse electrical potential difference, and the 2nd electrical potential difference is laser non-driver voltage. The 1st electrical-potential-difference impression means is a laser driver voltage impression means, the 3rd

electrical potential difference is a quantity of light programmed voltage, the 4th electrical potential difference is a nonluminescent programmed voltage, and the 2nd electrical-potential-difference impression means is attained by the two-dimensional semiconductor laser array luminescence equipment characterized by being a quantity of light programmed-voltage impression means. In the case of the two above-mentioned luminescence equipments, the voltage level (12V) of a nonluminescent programmed voltage is almost equal to the laser driver voltage level (12V) of a laser driving pulse electrical potential difference, or higher than it, and a quantity of light programmed voltage (0V-12V) is almost equal to the laser non-driver voltage level (0V) of a laser driving pulse electrical potential difference, or drives it with a voltage level higher than it. Or the voltage level of a nonluminescent programmed voltage is almost equal to the voltage level which lengthened the threshold voltage of laser from the laser driver voltage level of a laser driving pulse electrical potential difference, or it is higher than it, and a quantity of light programmed voltage is almost equal to the voltage level which lengthened the threshold voltage of laser from the laser non-driver voltage level of a laser driving pulse electrical potential difference, or is driven with a voltage level higher than it.

[0021] Furthermore, the above-mentioned object uses the 1st electrode as a cathode electrode, and uses the 2nd electrode as an anode electrode. The 1st electrical potential difference is a laser driving pulse electrical potential difference, and the 2nd electrical potential difference is laser non-driver voltage. The 1st electrical-potential-difference impression means is a laser driver voltage impression means, the 3rd electrical potential difference is a quantity of light programmed voltage, the 4th electrical potential difference is a nonluminescent programmed voltage, and the 2nd electrical-potential-difference impression means is attained by the two-dimensional semiconductor laser array luminescence equipment characterized by being a quantity of light programmed-voltage impression means. Furthermore, the above-mentioned object uses the 1st electrode as an anode electrode, and uses the 2nd electrode as a cathode electrode. The 1st electrical potential difference is a quantity of light programmed voltage, and the 2nd electrical potential difference is a nonluminescent programmed voltage. The 1st electrical-potential-difference impression means is a quantity of light programmed-voltage impression means, and the 3rd electrical potential difference is a laser driving pulse electrical potential difference. The 4th electrical potential difference is laser non-driver voltage, and the 2nd electrical-potential-difference impression means is attained by the two-dimensional semiconductor laser array luminescence equipment characterized by being a laser driver voltage impression means. In the case of the two above-mentioned luminescence equipments, the voltage level of a nonluminescent programmed voltage is almost equal to the laser driver voltage level of a laser driving pulse electrical potential difference, or it is lower than it, and a quantity of light programmed voltage is almost equal to the laser non-driver voltage level of a laser driving pulse electrical potential difference, or is driven with a voltage level lower than it. Or the voltage level of a nonluminescent programmed voltage is almost equal to the voltage level which lengthened the threshold voltage of laser from the laser driver voltage level of a laser driving pulse electrical potential difference, or it is lower than it, and a quantity of light programmed voltage is almost equal to the voltage level which lengthened the threshold voltage of laser from the laser non-driver voltage level of a laser driving pulse electrical potential difference, or is driven with a voltage level lower than it.

[0022] Thus, he is trying to set up beforehand the quantity of light programmed voltage of potential according to luminescence reinforcement with a quantity of light programmed-voltage impression means, before impressing an electrical potential difference from a laser driver voltage impression means on the laser driver voltage level which directs luminescence of the selected vertical resonance mold semiconductor laser component. Furthermore, he is trying for the laser non-driver voltage level of a laser driver voltage impression means and the nonluminescent programmed voltage of a quantity of light programmed-voltage impression means to become the potential of hard flow to a semiconductor laser component.

[0023] Thus, in this invention, as long as it changes the conventional actuation current pulse generating section into an electrical-potential-difference generating means and a current source is used so that the unjust current shown in drawing 9 which is a trouble at the time of applying actuation by the

conventional current pulse to the vertical resonance mold two-dimensional semiconductor laser array of matrix wiring with the broken line with an arrow head may not be generated, it makes it possible to replace potential control of impossible wiring with a voltage source. By carrying out like this, the potential of wiring is controlled and it becomes possible to impress the electrical potential difference of hard flow to the semiconductor laser components LD (1 1)-LD (n, m). Moreover, in drawing 9 , electrostatic capacity C (1 2)-C (1 m), C (2 2)-C (2 m), and C (n, 2)-C (n, m) can be operated as a decoupling capacitor of a voltage source. By doing in this way, it becomes possible to carry out pulse actuation of the vertical resonance mold two-dimensional semiconductor laser array luminescence equipment of matrix wiring, controlling the luminescence reinforcement.

[0024]

[Embodiment of the Invention] The two-dimensional semiconductor laser array luminescence equipment by the gestalt and its actuation approach of operation of this invention are explained using drawing 1 thru/or drawing 7 . Drawing 1 shows the configuration of the two-dimensional semiconductor laser array luminescence equipment by the gestalt of operation of this invention. In drawing 1 , the line wiring 3-1 extended to two or more line writing directions - 3-n are formed on a substrate, and the train wiring 2-1 which intersects perpendicularly to line wiring through an insulator layer (not shown) - 2-m are formed. A two-dimensional semiconductor laser array is formed in the crossover field of two or more line wiring 3-1 - 3-n, and the train wiring 2-1 - 2-m as the number 1 in drawing shows, and it has two or more vertical resonance mold semiconductor laser components LD (1 1)-LD (n, m) arranged in the shape of [of a n line xm train] a matrix. Each vertical resonance mold semiconductor laser component LD has the anode electrode connected with the cathode electrode connected to the line wiring 3-1 - 3-n at the train wiring 2-1 - 2-m, and emits light perpendicularly mostly to the substrate side of a substrate.

[0025] The quantity of light programmed-voltage impression section 5-1 for setting up beforehand the luminescence reinforcement of the desired vertical resonance mold semiconductor laser component LD to the vertical resonance mold semiconductor laser components LD (1 1)-LD (n, m) - 5-n are connected to two or more line wiring 3-1 - 3-n. The output voltage from the quantity of light programmed-voltage impression section 5-1 - 5-n is impressed to the cathode electrode of the vertical resonance semiconductor laser component LD connected to the line wiring 3-1 - 3-n, respectively. The range of 0V-12V is used corresponding to luminescence reinforcement, and he is trying for the quantity of light programmed voltage which makes the vertical resonance mold semiconductor laser component LD emit light to be in a nonluminescent condition by about 12 V. In the gestalt of this operation, the case where the quantity of light programmed voltage which makes a semiconductor laser component emit light is impressed is made into a selection condition, it supposes that it is in the condition of not choosing the case where the quantity of light programmed voltage (about 12 V) of a nonluminescent condition is impressed to a cathode electrical potential difference, and this electrical potential difference (12V) will be called a nonluminescent programmed voltage.

[0026] The laser driver voltage impression section 4-1 which directs luminescence of the desired vertical resonance mold semiconductor laser component LD to the vertical resonance mold semiconductor laser components LD (1 1)-LD (n, m) - 4-m are connected to two or more train wiring 2-1 - 2-m. The output voltage from the laser driver voltage impression section 4-1 - 4-n is impressed to the anode electrode of the vertical resonance semiconductor laser component LD connected to the train wiring 2-1 - 2-n, respectively. The laser driving pulse electrical potential difference which consists of laser non-driver voltage level (0V) which directs nonluminescent [which direct luminescence of the vertical resonance mold semiconductor laser component LD to selected train wiring by these laser driver voltage impression section 4-1 - 4-m / the laser driver voltage level (12V) and nonluminescent] is impressed. The laser non-driver voltage (0V) which directs nonluminescent [of the vertical resonance mold semiconductor laser component LD] to non-choosing train wiring is impressed.

[0027] Next, the typical equal circuit of the vertical resonance mold semiconductor laser components LD (1 1)-LD (n, m) is shown in drawing 4 . The vertical resonance mold semiconductor laser component LD is constituted by the resistance 13 and 14 by which the series connection was carried out to diode 12 and it, and the capacitor 15 connected to juxtaposition at these. Diode 12 is the

semiconductor laser component itself, and a laser beam generates it according to the current by which a constriction was carried out here. the layer (mirror layer) of the high reflection factor which resistance 13 and 14 is the internal resistance between the line wiring 3 of drawing 1 , and the cathode of diode 12, and between the anodes of the train wiring 2 and diode 12, and is mainly located in the ends of a laser cavity -- high -- since ****, it generates, and it has the resistance of several 100 ohms. Capacitors 15 are the stray capacity generated since the line wiring 3 and the train wiring 2 are the places of the vertical resonance mold semiconductor laser components LD (1 1)-LD (n, m) and it faces each other with a certain area, and electrostatic capacity which accompanies the laser component itself, and the capacity is usually 1-5pF.

[0028] Although it generates in each of the vertical resonance mold semiconductor laser components LD (1 1)-LD (n, m) and that capacity is several pF per one as C (n, m) showed to drawing 5 , this electrostatic capacity (capacitor 15) When its attention is paid to the line wiring 3 (or train wiring 2) of one, they are m pieces (). or the electrostatic capacity C of n pieces (capacitor 15) has connected, and abnormality luminescence of the semiconductor laser component in nonluminescent timing occurs, or In actuation by the current pulse which is the above-mentioned semiconductor laser actuation approach of the passage former, it is the cause which makes control of luminescence reinforcement impossible. In addition, drawing 5 is the same configuration as drawing 1 , and drawing 1 is drawing which omitted Capacitor C from drawing 5 , and the resistance 13 and 14 shown in drawing 4 is omitting the graphic display to drawing 1 and drawing 5 .

[0029] Next, drawing 2 is the example of a configuration of the quantity of light programmed-voltage impression section 5-1 for setting the potential according to luminescence reinforcement as the predetermined vertical resonance mold semiconductor laser component LD of the two-dimensional vertical resonance mold semiconductor laser luminescence equipment by the gestalt of this operation beforehand - 5-n. In drawing 2 , from the controller which is not illustrated, the D/A converter 7 changes into an analog value the 8-bit quantity of light setting-out data given in digital one, and sends them to the buffer section 8. bit of this quantity of light setting-out data -- a number does not need to be 8 bits and can be changed according to an application. Moreover, when this quantity of light setting-out data is analogically given from a controller, this D/A converter 7 is omissible and should just carry out direct continuation of the quantity of light setting-out data to the buffer section 8.

[0030] The buffer section 8 outputs a quantity of light programmed voltage in response to the output of the D/A converter 7. The main roles of the buffer section 8 are securing sufficient drive capacity driving the vertical resonance mold two-dimensional semiconductor laser array of drawing 1 linked to the next step. Although the buffer section 8 can be constituted from an amplifier with usually large drive capacity, such as an op amplifier, it can also consist of discrete part, such as a transistor and a resistor. Moreover, for example, by 0-12V, the electrical-potential-difference range which needs the output voltage range of the D/A converter 7 as 0-1V, and a quantity of light programmed voltage can be solved by making the amplification factor of the buffer section 8 into 12 times instead of 1 time etc., when the electrical-potential-difference range is mismatching.

[0031] Next, drawing 3 is the example of a configuration of the laser driver voltage impression section 4 which generates the laser driving pulse electrical potential difference for directing the luminescence timing of the vertical resonance mold semiconductor laser component LD in the gestalt of this operation. In drawing 3 , the buffer section 10 changes into a luminescence timing electrical-potential-difference pulse the luminescence timing given from the controller which is not illustrated, and outputs it as a laser driving pulse electrical potential difference. The main duties of the buffer section 10 have two, since luminescence timing is usually outputted from a logic IC (voltage levels are TTL level and ECL level), change [securing sufficient drive capacity driving the vertical resonance mold two-dimensional semiconductor laser array of drawing 1 linked to the next step, and] into the electrical-potential-difference range (for example, 0-12V) required as a laser driving pulse electrical potential difference. Like the buffer section 8, although the buffer section 10 can be constituted from an amplifier with large drive capacity, such as an op amplifier, it can also consist of discrete part, such as a transistor and a resistor.

[0032] The two-dimensional vertical resonance mold semiconductor laser array luminescence equipment by the gestalt of this operation is constituted as mentioned above, and explains the actuation approach below. It precedes outputting the potential the laser driver voltage impression section 4 instructs luminescence to be to an anode electrode in drawing 5 . The quantity of light programmed-voltage impression section 5 connected to the line wiring 3 sets up the potential according to luminescence reinforcement beforehand to the anode electrode connected to the line wiring 3 concerned. Then, the laser driver voltage impression section 4 which generates the laser driving pulse electrical potential difference for directing luminescence timing connected to the train wiring 2 connected to the anode electrode impresses an electrical potential difference to the train wiring 2 on the laser driver voltage level which directs luminescence. The example which drove the vertical resonance mold two-dimensional semiconductor laser array with the configuration shown in this drawing 5 is shown in drawing 6 and drawing 7 .
[0033] Drawing 6 and drawing 7 show the result of having searched for the current which flows for the vertical resonance mold semiconductor laser components LD (1 1)-LD (n, m) when driving a vertical resonance mold two-dimensional semiconductor laser array with the configuration shown in drawing 5 using the standard simulator of an analog electrical circuit. Drawing 6 (a) shows the potential which the laser driver voltage impression section 4-1 generates, and drawing 6 (b) shows the potential which the laser driver voltage impression section 4-2 - 4-m generate. Moreover, drawing 6 (c) shows the potential which the quantity of light programmed-voltage impression section 5-1 generates, and drawing 6 (d) shows the potential which the quantity of light programmed-voltage impression section 5-2 - 5-m generate. And drawing 7 (a) shows the current which flows for the vertical resonance mold semiconductor laser component LD (1 1), and drawing 7 (b) shows the current which flows for the vertical resonance mold semiconductor laser components LD (2 1)-LD (n, 1). The current to which drawing 7 (c) flows for the vertical resonance mold semiconductor laser components LD (1 2)-LD (1 m), and drawing 7 (d) are currents which flow for the vertical resonance mold semiconductor laser components LD (2 2)-LD (n, m).
[0034] In this example, give a laser driving pulse electrical potential difference only to the laser driver voltage impression section 4-1 connected to the train wiring 2-1 among the laser driver voltage impression sections 4, and it considers as a selection condition. Other laser driver voltage impression sections 4-2 - 4-m are made into laser non-driver voltage (0V) so that it may be in the condition (condition of not choosing) of disabling. Moreover, give the setting-out potential which sets the quantity of light only to the quantity of light programmed-voltage impression section 5-1 connected to the line wiring 3-1 among the quantity of light programmed-voltage impression sections 5, and it considers as a selection condition. By considering as a nonluminescent programmed voltage (12V) so that it may be in the condition (condition of not choosing) of disabling, other quantity of light programmed-voltage impression sections 5-2 - 5-n Carrying out pulse luminescence to the timing of a request of the vertical resonance mold semiconductor laser component LD of drawing 5 (1 1), other vertical resonance mold semiconductor laser components LD (1 2)-LD (n, m) are as a result of [you tried to make it always switch off] simulation.
[0035] In drawing 6 (a), the laser driver voltage impression section 4-1 supplies the electrical potential difference of laser driver voltage level (12V) to the line wiring 3-1 between about 17ns and 38ns. the quantity of light programmed voltage (the potential which the quantity of light programmed-voltage impression section 5-1 generates --) beforehand set up at this time Referring to drawing 6 (c) is 0V (potential which directs luminescence with the maximum quantity of light), and as shown in drawing 7 (a), about 14mA pulse current flows for the vertical resonance mold semiconductor laser component LD (1 1). If the threshold current of laser luminescence of a vertical resonance mold two-dimensional semiconductor laser array is set to 3mA illustrated with the auxiliary conductor to drawing 7 (a) - (d), the vertical resonance mold semiconductor laser component LD (1 1) will carry out laser luminescence, will show the response characteristic which was extremely excellent in the laser driving pulse electrical potential difference which the laser driver voltage impression section 4-1 moreover generates, and can perform high-speed actuation. Moreover, the vertical resonance mold semiconductor laser component

LD (1 1) has generated the maximum quantity of light in this system at this time.
[0036] next, the laser driver voltage impression section 4-1 supplies the laser driving pulse electrical potential difference of 12V to the line wiring 3-1 again in about 58ns - 79ns -- **** (refer to drawing 6 (a)) -- the quantity of light programmed voltage (the potential which the quantity of light programmed-voltage impression section 5-1 generates --) set up beforehand In order that referring to drawing 6 (c) may be 12V (potential which directs putting out lights), only the minute pulse current for about several ns may flow for the vertical resonance mold semiconductor laser component LD (1 1) as shown in drawing 7 (a), and this may not exceed the threshold of 3mA of laser luminescence, The vertical resonance mold semiconductor laser component LD (1 1) does not emit light.
[0037] next, the laser driver voltage impression section 4-1 supplies the laser driving pulse electrical potential difference of 12V to the line wiring 3-1 again in about 97ns - 119ns -- **** (drawing 6 (a)) -- the quantity of light programmed voltage (the potential which the quantity of light programmed-voltage impression section 5-1 generates --) set up beforehand Referring to drawing 6 (c) is 2V (potential which directs the quantity of light somewhat smaller than the maximum quantity of light), and as shown in drawing 7 (a), about 11mA pulse current flows for the vertical resonance mold semiconductor laser component LD (1 1). Although this exceeds the threshold of 3mA of laser luminescence and the vertical resonance mold semiconductor laser component LD (1 1) carries out laser luminescence, it is smaller than previous luminescence reinforcement.
[0038] Now, there is no unusual luminescence which a current which results in laser luminescence does not flow as vertical resonance mold semiconductor laser components other than the vertical resonance mold semiconductor laser component LD (1 1) were shown in drawing 7 (b) - (d) in these three pulse actuation, therefore was generated in drawing 11 (a) - (b). This is realized by having constituted to the vertical resonance mold semiconductor laser component which does not emit light, so that the potential of the anode electrode might become lower than the potential of a cathode electrode.
[0039] Thus, since according to the gestalt of this operation abnormality luminescence of the semiconductor laser component in nonluminescent timing is prevented and control of luminescence reinforcement is attained, actuation of the vertical resonance mold semiconductor laser equipment of matrix wiring is attained, and it becomes possible to use it, including in a printer, communication equipment, a display, an optical memory unit, etc.
[0040] Not only the gestalt of the above-mentioned implementation but various deformation is possible for this invention. For example, in the gestalt of the above-mentioned implementation, the cathode electrode of the vertical resonance mold semiconductor laser component LD is connected to the line wiring 3, and an anode electrode is connected to the train wiring 2, and the electrical potential difference from the quantity of light programmed-voltage impression section 5 is impressed to a cathode electrode, and although the configuration impressed to an anode electrode explained the electrical potential difference from the laser driver voltage impression section 4, this invention is not restricted to this. The anode electrode of the vertical resonance mold semiconductor laser component LD may be connected to the line wiring 3, and a cathode electrode may be connected to the train wiring 2, and the electrical potential difference from the quantity of light programmed-voltage impression section 5 may be impressed to a cathode electrode, and the configuration impressed to an anode electrode is sufficient as the electrical potential difference from the laser driver voltage impression section 4. Moreover, the cathode electrode of the vertical resonance mold semiconductor laser component LD is connected to the line wiring 3. An anode electrode is connected to the train wiring 2, and the electrical potential difference from the quantity of light programmed-voltage impression section 5 is impressed to an anode electrode. The configuration impressed to a cathode electrode is sufficient as the electrical potential difference from the laser driver voltage impression section 4, and The anode electrode of the vertical resonance mold semiconductor laser component LD may be connected to the line wiring 3, and a cathode electrode may be connected to the train wiring 2, and the electrical potential difference from the quantity of light programmed-voltage impression section 5 may be impressed to an anode electrode, and the configuration impressed to a cathode electrode is sufficient as the electrical potential difference from the laser driver voltage impression section 4. What is necessary is just to adjust the level of the output

voltage from the laser driver voltage impression section 4 and the quantity of light programmed-voltage impression section 5 so that it may become [whether cathode potential is almost equal to anode potential, and] high even if it uses which configuration.

[0041]

[Effect of the Invention] Since according to this invention the above passage abnormality luminescence of the semiconductor laser component in nonluminescent timing is prevented and control of luminescence reinforcement is attained, actuation of the vertical resonance mold semiconductor laser equipment of matrix wiring is attained, and it becomes possible to use it, including in a printer, communication equipment, a display, an optical memory unit, etc.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention] This invention relates to the two-dimensional semiconductor laser array luminescence equipment which has arranged the vertical resonance mold semiconductor laser component to each crossover field of two or more line wiring and two or more train wiring, and its actuation approach.

[Translation done.]

* NOTICES *

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1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

PRIOR ART

[Description of the Prior Art] Conventionally, a semiconductor laser component is formed near [a crossover field] each [of two or more line wiring on a substrate, and two or more train wiring], and JP,2-198184,A, JP,7-86691,A, etc. have disclosure as semiconductor laser array luminescence equipment which carries out two-dimensional (field) luminescence by the semiconductor laser array arranged in the shape of a matrix. The two-dimensional semiconductor laser array indicated by JP,2-198184,A forms the vertical resonance mold semiconductor laser component by which the laser cavity end face was perpendicularly formed to the substrate side in the shape of a matrix by forming the current block layer of a half-insulator layer in a component formation field, adding the impurity of an anti-conductivity type [section / by the side of a substrate / request / substrate], forming a component isolation region, and forming a cathode electrode and an anode electrode further at the vertical section, respectively. Moreover, the two-dimensional semiconductor laser array indicated by JP,7-86691,A arranges the surface emission-type laser component of a level resonance mold to an insulating substrate two-dimensional, is extended in the direction of cavity length of each surface emission-type laser component, forms a lower layer electrode in the shape of a line, prepares the electrode insulation section for every line, and has the composition of having prepared the upper electrode in the line-like pattern which intersects perpendicularly with a lower layer electrode.
[0003] The laser actuation approach of making the above two-dimensional semiconductor laser arrays emitting light is explained below. The laser actuation approach in the semiconductor laser component and 1-dimensional semiconductor laser array of a simple substance which are not arranged introduction and in the shape of a matrix is explained. Generally making the semiconductor laser component or 1-dimensional semiconductor laser array of these simple substances drive using constant current or a current pulse is performed. Moreover, when it is going to change laser luminescence reinforcement, as the light guide of a part of laser beam is carried out to a photosensor, the closed loop of negative feedback is constituted so that a reference value may become equal about the output of a photosensor, and the value of constant current or a current pulse is adjusted, laser luminescence reinforcement is controlled.
[0004] Thus, laser oscillation arises according to the current by which to use constant current or a current pulse for actuation of a semiconductor laser component was set to the 1st, and the constriction of the semiconductor laser component was carried out to the luminescence field, and laser intensity is based on the principle of operation of the semiconductor laser component of having the property proportional to the amount of currents. The level resonance mold semiconductor laser component is conventionally used [2nd] for the semiconductor laser component or the 1-dimensional semiconductor laser array, and actuation by constant current or the current pulse is performed based on the operating characteristic.
[0005] The current-electrical-potential-difference (I-V) property of a level resonance mold semiconductor laser component, and a current / luminescence property on the strength (I-L) are shown in drawing 12 . The inclination of the curve which shows the I-L property of a level resonance mold semiconductor laser component in drawing 12 is 0.5-1.0. mW/mA The inclination of the curve which

shows an I-V property is 0.01 to being extent. V/mA It is extent. The case where luminescence reinforcement is controlled by resolution of 8 bits for between the luminescence reinforcement P1-P2 in drawing 12 is considered. If a current is chosen as a controlling factor of luminescence reinforcement at this time, since what is necessary is just to control the large area of the actuation currents I1-I2 of drawing 12 by resolution of 8 bits, control of luminescence reinforcement is easy. However, although the very narrow range of the electrical potential differences V1-V2 of drawing 12 must be controlled by resolution of 8 bits if an electrical potential difference is chosen as a controlling factor of luminescence reinforcement, implementation of the control unit which can control such narrow electrical-potential-difference range of 8 bits by resolution is difficult. Moreover, in such a short range, it may also arise that that the feeble noise mixed will also separate from the range of the desired luminescence reinforcement P1-P2 greatly, and a component will be destroyed.
[0006] It was common to have performed actuation and control of luminescence reinforcement for the above reason by controlling a current by the semiconductor laser component and 1-dimensional semiconductor laser array of a level resonance mold. On the other hand, in the case of the vertical resonance mold semiconductor laser component, as shown in drawing 13 , the current-electrical-potential-difference (I-V) property is superior to the level resonance mold semiconductor laser component, and it is possible to carry out electrical-potential-difference actuation. The inclination of the curve which shows the I-V property of a vertical resonance mold semiconductor laser component as shown in drawing 13 is 0.5. It is about V/mA. 0.01 of the level resonance mold semiconductor laser component of drawing 12 It compares with about V/mA. For example, even when controlling between the luminescence reinforcement P1-P2 by resolution of 8 bits, since what is necessary is just to be able to control the electrical potential difference of the comparatively large range of V1-V2 by resolution of 8 bits, it has the possibility of electrical-potential-difference actuation fundamentally. However, since the vertical resonance mold semiconductor laser component has the same I-L property as a level resonance mold semiconductor laser component, if it is actuation by the low frequency pulse, the actuation method by current control is adopted chiefly.
[0007] Now, the case where pulse actuation is carried out by the current pulse the same with having driven an above-mentioned semiconductor laser component and an above-mentioned 1-dimensional semiconductor laser array about the two-dimensional semiconductor laser array which consists of semiconductor laser components of the level resonance mold arranged in the shape of a matrix near [a crossover field] each [of two or more line wiring on a substrate and two or more train wiring] or a vertical resonance mold is explained.
[0008] The structure of a two-dimensional semiconductor laser array is shown in drawing 8 . In drawing 8 , the line wiring 3 extended to two or more line writing directions is formed on a substrate, and the train wiring 3 which intersects perpendicularly to line wiring through an insulator layer is formed. A suffix (-1, -2 grade) is given to each line wiring 3 and the train wiring 2, and each wiring is distinguished and shown. A two-dimensional semiconductor laser array is formed in the crossover field of two or more line wiring 3 and the train wiring 2 as the number 1 in drawing shows, and it has two or more semiconductor laser components LD arranged in the shape of [of a n line xm train] a matrix. The suffix (n, m) is given to the semiconductor laser component LD in drawing. The enabling electrical-potential-difference generating section 18 which one train of the arbitration of the train wiring 2 is chosen [section], and makes the selected train wiring 2 generate an enabling electrical potential difference is formed in the end section of the train wiring 2. The actuation current pulse generating section 17 which generates the current pulse for directing the luminescence reinforcement and luminescence timing of a semiconductor laser component on the selected train wiring 2 is formed in the end section of the line wiring 3. The suffix (-1, -2 grade) corresponding to each wiring is attached, and is distinguished and shown also in the ****** enabling electrical-potential-difference generating section 18 and the actuation current pulse generating section 17.
[0009] A current is supplied from the actuation current pulse generating section 17-1 by which the cathode electrode was connected to the line wiring 3-1 of n - 3-n, respectively, and the semiconductor laser components LD (1 1)-LD (n, m) of the two-dimensional semiconductor laser array of a n line xm

train were connected to the line wiring 3-1 - 3-n, respectively - 17-n. Moreover, an electrical potential difference is impressed to each anode electrode from the enabling electrical-potential-difference generating section 18-1 which was connected to the train wiring 2-1 of m - 2-n, and was connected to the train wiring 2-1 - 2-n, respectively - 18-n. Moreover, the electrostatic capacity generated to each crossover field of line wiring shown by the number 1 in drawing and train wiring is shown as C (1 1)-C (n, m).

[0010] Next, the result of having searched for the current which flows for the semiconductor laser components LD (1 1)-LD (n, m) when driving a two-dimensional semiconductor laser array about the two-dimensional semiconductor laser array of such a configuration using the standard simulator of an analog electrical circuit is explained using drawing 10 and 11. Drawing 10 (a) shows the potential which the enabling electrical-potential-difference generating section 18-1 generates, and drawing 10 (b) shows the potential which the enabling electrical-potential-difference generating section 18-2 - 18-m generate. Drawing 10 (c) shows the current pulse which the current pulse generating section 17-1 generates, and drawing 10 (d) shows the current which the current pulse generating section 17-2 - 17-n generate. The current to which drawing 11 (a) flows for the semiconductor laser component LD (1 1), the current to which drawing 11 (b) flows for the semiconductor laser components LD (2 1)-LD (n, 1), and drawing 11 (c) show the potential of the line wiring 3-1, and drawing 11 (d) shows the potential of the line wiring 3-2 - 3-n.

[0011] In this example of simulation, only the train wiring 2-1 is chosen by giving enabling potential (12V) only to the enabling electrical-potential-difference generating section 18-1 connected to the train wiring 2-1 among the enabling electrical-potential-difference generating sections 18, and giving disabling potential (0V) to the enabling electrical-potential-difference generating section 18-2 of other train wiring 2-2 - 2-m - 18-m (refer to drawing 10 (a) and (b)). Moreover, an actuation current pulse is given only to the current pulse generating section 17-1 connected to the line wiring 3-1 among the current pulse generating sections 17, and the current pulse generating section 17-2 connected to other line wiring 17-2 - n - 17-n make the actuation current zero (refer to drawing 10 (c) and (d)). That is, in this example of simulation, pulse luminescence is carried out to the timing of a request of the semiconductor laser component LD in drawing 8 (1 1), and other semiconductor laser components LD (1 2)-LD (n, m) are as a result of [at the time of making it drive so that the light may be made to always put out] simulation.

[0012] In drawing 10 (c) which shows the current pulse which the actuation current pulse generating section 17-1 generates, although the current pulse generating section 17-1 supplies 8mA pulse current to the line wiring 3-1 from about 21 to 43ns At this time, the enabling electrical-potential-difference generating section 18-1 is that which is not enabling potential (that is, it is disabling potential). As shown in drawing 11 (a) which shows the current which flows for the semiconductor laser component LD, and (b), the normal condition that a current does not flow for all the semiconductor laser components LD (1 1)-LD (n, 1) of the selected train wiring 2-1, therefore there is also no laser luminescence is maintained. However, situations differed to the pulse current which the current pulse generating section 17-1 for about 61ns - 83ns generates, and as shown in drawing 11 (a) and (b), the semiconductor laser components LD (1 1)-LD (n, 1) have carried out abnormality luminescence.

[0013] It doubles at the event of about 45ns when the enabling electrical-potential-difference generating section 18-1 becomes enabling potential in drawing 10 (a). An unjust current begins (refer to drawing 11 (a)) to flow for the semiconductor laser component LD (1 1). About 83ns or subsequent ones when the current pulse generating section 17-1 finished supplying pulse current like drawing 10 (c) continues, and this unjust current continues till the event (refer to drawing 10 (a)) of about 87ns when the enabling electrical-potential-difference generating section 18-1 returns to disabling potential. If the threshold current of laser luminescence of the two-dimensional semiconductor laser array shown in drawing 11 (a) and (b) as an auxiliary conductor is set to 3mA, this unjust current will exceed a threshold and the semiconductor laser component LD (1 1) will carry out laser luminescence to the timing which is not meant. Furthermore, at this time, an unjust current flows also for the semiconductor laser components LD (2 1)-LD (n, 1) to which the actuation current should not be supplied at all from the current pulse

generating section 17 (refer to drawing 11 (b)), and abnormality luminescence is carried out exceeding the threshold of laser luminescence.

[Translation done.]

* NOTICES *

EFFECT OF THE INVENTION

[Effect of the Invention] Since according to this invention the above passage abnormality luminescence of the semiconductor laser component in nonluminescent timing is prevented and control of luminescence reinforcement is attained, actuation of the vertical resonance mold semiconductor laser equipment of matrix wiring is attained, and it becomes possible to use it, including in a printer, communication equipment, a display, an optical memory unit, etc.

[Translation done.]

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] It will be because it becomes what cannot disregard existence of the electrostatic capacity during matrix wiring (C (1 1)-C (n, m) of drawing 8) that these unjust currents pose a problem, if pulse actuation of the semiconductor laser component tends to be carried out on the high frequency of nanosecond order. The enabling electrical-potential-difference generating section 18-1 explains the reason of this unjust current generating using drawing 9 about the case where enabling, and 18-2 - 18-m are disabling. In order that drawing 9 may make an understanding easy, the configuration of a two-dimensional semiconductor laser array shown in drawing 8 is reexpressed, and there is no different point from the configuration of drawing 8 . In drawing 9 , as the broken line with an arrow head showed, a current flows to electrostatic capacity C (1 2)-C (1 m) through the semiconductor laser component LD (1 1) at the flash when the enabling electrical-potential-difference generating section 18-1 became enabling potential (12V). Moreover, a current flows to electrostatic capacity C (2 2)-C (2 m) through the semiconductor laser component LD (2 1) similarly, a current flows to electrostatic capacity C (n, 2)-C (n, m) through the semiconductor laser component LD (n, 1), and this causes an unjust current. Moreover, potential rises with are recording of a charge, and electrostatic capacity C (1 2)-C (1 m), electrostatic capacity C (2 2)-C (2 m), and electrostatic capacity C (n, 2)-C (n, m) are shown in drawing 11 (c) and (d), and show potential change [like].
[0015] The unjust current which flows for such a semiconductor laser component LD It is added to the actuation current which the actuation current pulse generating section 17 generates, and the semiconductor laser components LD (1 1)-LD (n, 1) are supplied. Since the current value changes depending on the charge accumulated in electrostatic capacity C (1 2)-C (1 m), electrostatic capacity C (2 2)-C (2 m), and electrostatic capacity C (n, 2)-C (n, m), It also makes it very difficult to change every moment, therefore to control the luminescence reinforcement of the semiconductor laser component LD. Thus, if the conventional actuation approach of driving a semiconductor laser component by the current pulse is applied to two-dimensional semiconductor laser array luminescence equipment, with the electrostatic capacity generated in a part for the intersection of the above lines and train wiring, abnormality luminescence of a semiconductor laser component occurs to nonluminescent timing, and it has the problem that control of luminescence reinforcement becomes impossible further.
[0016] Moreover, SPIE According to the actuation approach about the two-dimensional semiconductor laser array of Proceedings, Vol.2147, and matrix wiring indicated by P.9, if a two-dimensional semiconductor laser array is replaced with the conventional current actuation and electrical-potential-difference actuation is carried out, it is cheaper than current actuation, and it is indicated that it can drive to stability more depending on conditions. However, the practical and concrete driving gear and the actuation approach (actuation procedure) are not indicated at all on the assumption that existence of the electrostatic capacity by matrix wiring.
[0017] The object of this invention is to offer the two-dimensional semiconductor laser array luminescence equipment which does not produce the unjust current which originates in the electrostatic capacity produced near [a crossover field] each [of two or more line wiring and two or more train wiring], and flows to a semiconductor laser component, and its actuation approach. Moreover, this

invention prevents abnormality luminescence of a semiconductor laser component, and is to offer two-dimensional semiconductor laser array luminescence equipment excellent in the controllability of luminescence reinforcement, and its actuation approach.

[Translation done.]

MEANS

[Means for Solving the Problem] Then, as a result of repeating research wholeheartedly about the approach of carrying out pulse actuation of the two-dimensional semiconductor laser array of matrix wiring, controlling luminescence reinforcement, this invention persons impressed quantity of light setting-out potential to line wiring (or train wiring) about the two-dimensional semiconductor laser array of a vertical resonance mold, and reached a header and this invention in the actuation approach of adding a luminescence timing electrical-potential-difference pulse to train wiring (or line wiring). Namely, two or more train wiring formed by the above-mentioned object intersecting two or more line wiring formed on the substrate, and two or more line wiring, Two or more vertical resonance mold semiconductor laser components which are formed near [a crossover field] each [of line wiring and train wiring], respectively, have the 1st electrode connected to line wiring, and the 2nd electrode connected to train wiring, and emit light perpendicularly mostly to the substrate side of a substrate, The 1st electrical-potential-difference impression means which impresses the 1st electrical potential difference to selection line wiring chosen from two or more line wiring, and impresses the 2nd electrical potential difference to non-choosing line wiring, It is attained by two-dimensional semiconductor laser array luminescence equipment equipped with the 2nd electrical-potential-difference impression means which impresses the 3rd electrical potential difference to selection train wiring chosen from two or more train wiring, and impresses the 4th electrical potential difference to non-choosing train wiring.
[0019] If it matches and explains to drawing 1 which expresses the gestalt of 1 operation more concretely and drawing 6 , and drawing 7 Two or more train wiring formed by intersecting two or more line wiring (3-1 - 3-n) and them (2-1 - 2-m), It is formed in each about one crossover field of line wiring (3-1 - 3-n) and train wiring (2-1 - 2-m), respectively. It has the 1st electrode (cathode electrode) connected to line wiring (3-1 - 3-n), and the 2nd electrode (anode electrode) connected to train wiring (2-1 - 2-m). Two or more vertical resonance mold semiconductor laser components which emit light perpendicularly mostly to the substrate side of a substrate (LD (1 1)-LD (n, m)), The quantity of light programmed voltage (0V-12V) which was chosen from two or more line wiring (3-1 - 3-n) and which sets up the luminescence reinforcement of a vertical resonance mold semiconductor laser component (LD (1 1)) as the 1st electrical potential difference, for example to selection line wiring (3-1) is impressed. As 1st electrical-potential-difference impression means which impresses the nonluminescent programmed voltage (12V) which makes nonluminescent vertical resonance mold semiconductor laser components other than the vertical resonance mold semiconductor laser component chosen as the 2nd electrical potential difference to non-choosing line wiring A quantity of light programmed-voltage impression means to impress beforehand a quantity of light programmed voltage and a nonluminescent programmed voltage to predetermined line wiring (3-1 - 3-n) before luminescence of the selected vertical resonance mold semiconductor laser component (LD (1 1)) (5-1 - 5-n), As opposed to for example, selection train wiring (2-1) chosen from two or more train wiring (2-1 - 2-m) The laser driving pulse electrical potential difference (refer to drawing 6 (a)) which consists of laser non-driver voltage level (0V) which directs nonluminescent [which direct luminescence of the vertical resonance mold semiconductor laser component chosen as the 3rd electrical potential difference / the laser driver voltage

level (12V) and nonluminescent] is impressed. As 2nd electrical-potential-difference impression means which impresses the laser non-driver voltage (0V) which directs nonluminescent [of vertical resonance mold semiconductor laser components other than the vertical resonance mold semiconductor laser component chosen as the 4th electrical potential difference to non-choosing train wiring] The above-mentioned object is attained by two-dimensional semiconductor laser array luminescence equipment equipped with a laser driver voltage impression means (4-1 - 4-m) to impress a ** laser driving pulse electrical potential difference (0V and 12V) and laser non-driver voltage (0V) to predetermined train wiring.

[0020] And the above-mentioned object uses the 1st electrode as an anode electrode, and uses the 2nd electrode as a cathode electrode. The 1st electrical potential difference is a laser driving pulse electrical potential difference, and the 2nd electrical potential difference is laser non-driver voltage. The 1st electrical-potential-difference impression means is a laser driver voltage impression means, the 3rd electrical potential difference is a quantity of light programmed voltage, the 4th electrical potential difference is a nonluminescent programmed voltage, and the 2nd electrical-potential-difference impression means is attained by the two-dimensional semiconductor laser array luminescence equipment characterized by being a quantity of light programmed-voltage impression means. In the case of the two above-mentioned luminescence equipments, the voltage level (12V) of a nonluminescent programmed voltage is almost equal to the laser driver voltage level (12V) of a laser driving pulse electrical potential difference, or higher than it, and a quantity of light programmed voltage (0V-12V) is almost equal to the laser non-driver voltage level (0V) of a laser driving pulse electrical potential difference, or drives it with a voltage level higher than it. Or the voltage level of a nonluminescent programmed voltage is almost equal to the voltage level which lengthened the threshold voltage of laser from the laser driver voltage level of a laser driving pulse electrical potential difference, or it is higher than it, and a quantity of light programmed voltage is almost equal to the voltage level which lengthened the threshold voltage of laser from the laser non-driver voltage level of a laser driving pulse electrical potential difference, or is driven with a voltage level higher than it.

[0021] Furthermore, the above-mentioned object uses the 1st electrode as a cathode electrode, and uses the 2nd electrode as an anode electrode. The 1st electrical potential difference is a laser driving pulse electrical potential difference, and the 2nd electrical potential difference is laser non-driver voltage. The 1st electrical-potential-difference impression means is a laser driver voltage impression means, the 3rd electrical potential difference is a quantity of light programmed voltage, the 4th electrical potential difference is a nonluminescent programmed voltage, and the 2nd electrical-potential-difference impression means is attained by the two-dimensional semiconductor laser array luminescence equipment characterized by being a quantity of light programmed-voltage impression means. Furthermore, the above-mentioned object uses the 1st electrode as an anode electrode, and uses the 2nd electrode as a cathode electrode. The 1st electrical potential difference is a quantity of light programmed voltage, and the 2nd electrical potential difference is a nonluminescent programmed voltage. The 1st electrical-potential-difference impression means is a quantity of light programmed-voltage impression means, and the 3rd electrical potential difference is a laser driving pulse electrical potential difference. The 4th electrical potential difference is laser non-driver voltage, and the 2nd electrical-potential-difference impression means is attained by the two-dimensional semiconductor laser array luminescence equipment characterized by being a laser driver voltage impression means. In the case of the two above-mentioned luminescence equipments, the voltage level of a nonluminescent programmed voltage is almost equal to the laser driver voltage level of a laser driving pulse electrical potential difference, or it is lower than it, and a quantity of light programmed voltage is almost equal to the laser non-driver voltage level of a laser driving pulse electrical potential difference, or is driven with a voltage level lower than it. Or the voltage level of a nonluminescent programmed voltage is almost equal to the voltage level which lengthened the threshold voltage of laser from the laser driver voltage level of a laser driving pulse electrical potential difference, or it is lower than it, and a quantity of light programmed voltage is almost equal to the voltage level which lengthened the threshold voltage of laser from the laser non-driver voltage level of a laser driving pulse electrical potential difference, or is driven with a voltage level

lower than it.

[0022] Thus, he is trying to set up beforehand the quantity of light programmed voltage of potential according to luminescence reinforcement with a quantity of light programmed-voltage impression means, before impressing an electrical potential difference from a laser driver voltage impression means on the laser driver voltage level which directs luminescence of the selected vertical resonance mold semiconductor laser component. Furthermore, he is trying for the laser non-driver voltage level of a laser driver voltage impression means and the nonluminescent programmed voltage of a quantity of light programmed-voltage impression means to become the potential of hard flow to a semiconductor laser component.

[0023] Thus, in this invention, as long as it changes the conventional actuation current pulse generating section into an electrical-potential-difference generating means and a current source is used so that the unjust current shown in drawing 9 which is a trouble at the time of applying actuation by the conventional current pulse to the vertical resonance mold two-dimensional semiconductor laser array of matrix wiring with the broken line with an arrow head may not be generated, it makes it possible to replace potential control of impossible wiring with a voltage source. By carrying out like this, the potential of wiring is controlled and it becomes possible to impress the electrical potential difference of hard flow to the semiconductor laser components LD (1 1)-LD (n, m). Moreover, in drawing 9 , electrostatic capacity C (1 2)-C (1 m), C (2 2)-C (2 m), and C (n, 2)-C (n, m) can be operated as a decoupling capacitor of a voltage source. By doing in this way, it becomes possible to carry out pulse actuation of the vertical resonance mold two-dimensional semiconductor laser array luminescence equipment of matrix wiring, controlling the luminescence reinforcement.

[0024]

[Embodiment of the Invention] The two-dimensional semiconductor laser array luminescence equipment by the gestalt and its actuation approach of operation of this invention are explained using drawing 1 thru/or drawing 7 . Drawing 1 shows the configuration of the two-dimensional semiconductor laser array luminescence equipment by the gestalt of operation of this invention. In drawing 1 , the line wiring 3-1 extended to two or more line writing directions - 3-n are formed on a substrate, and the train wiring 2-1 which intersects perpendicularly to line wiring through an insulator layer (not shown) - 2-m are formed. A two-dimensional semiconductor laser array is formed in the crossover field of two or more line wiring 3-1 - 3-n, and the train wiring 2-1 - 2-m as the number 1 in drawing shows, and it has two or more vertical resonance mold semiconductor laser components LD (1 1)-LD (n, m) arranged in the shape of [of a n line xm train] a matrix. Each vertical resonance mold semiconductor laser component LD has the anode electrode connected with the cathode electrode connected to the line wiring 3-1 - 3-n at the train wiring 2-1 - 2-m, and emits light perpendicularly mostly to the substrate side of a substrate.

[0025] The quantity of light programmed-voltage impression section 5-1 for setting up beforehand the luminescence reinforcement of the desired vertical resonance mold semiconductor laser component LD to the vertical resonance mold semiconductor laser components LD (1 1)-LD (n, m) - 5-n are connected to two or more line wiring 3-1 - 3-n. The output voltage from the quantity of light programmed-voltage impression section 5-1 - 5-n is impressed to the cathode electrode of the vertical resonance semiconductor laser component LD connected to the line wiring 3-1 - 3-n, respectively. The range of 0V-12V is used corresponding to luminescence reinforcement, and he is trying for the quantity of light programmed voltage which makes the vertical resonance mold semiconductor laser component LD emit light to be in a nonluminescent condition by about 12 V. In the gestalt of this operation, the case where the quantity of light programmed voltage which makes a semiconductor laser component emit light is impressed is made into a selection condition, it supposes that it is in the condition of not choosing the case where the quantity of light programmed voltage (about 12 V) of a nonluminescent condition is impressed to a cathode electrical potential difference, and this electrical potential difference (12V) will be called a nonluminescent programmed voltage.

[0026] The laser driver voltage impression section 4-1 which directs luminescence of the desired vertical resonance mold semiconductor laser component LD to the vertical resonance mold semiconductor laser components LD (1 1)-LD (n, m) - 4-m are connected to two or more train wiring 2-1 - 2-m. The output

voltage from the laser driver voltage impression section 4-1 - 4-n is impressed to the anode electrode of the vertical resonance semiconductor laser component LD connected to the train wiring 2-1 - 2-n, respectively. The laser driving pulse electrical potential difference which consists of laser non-driver voltage level (0V) which directs nonluminescent [which direct luminescence of the vertical resonance mold semiconductor laser component LD to selected train wiring by these laser driver voltage impression section 4-1 - 4-m / the laser driver voltage level (12V) and nonluminescent] is impressed. The laser non-driver voltage (0V) which directs nonluminescent [of the vertical resonance mold semiconductor laser component LD] to non-choosing train wiring is impressed.

[0027] Next, the typical equal circuit of the vertical resonance mold semiconductor laser components LD (1 1)-LD (n, m) is shown in drawing 4 . The vertical resonance mold semiconductor laser component LD is constituted by the resistance 13 and 14 by which the series connection was carried out to diode 12 and it, and the capacitor 15 connected to juxtaposition at these. Diode 12 is the semiconductor laser component itself, and a laser beam generates it according to the current by which a constriction was carried out here. the layer (mirror layer) of the high reflection factor which resistance 13 and 14 is the internal resistance between the line wiring 3 of drawing 1 , and the cathode of diode 12, and between the anodes of the train wiring 2 and diode 12, and is mainly located in the ends of a laser cavity -- high -- since ****, it generates, and it has the resistance of several 100 ohms. Capacitors 15 are the stray capacity generated since the line wiring 3 and the train wiring 2 are the places of the vertical resonance mold semiconductor laser components LD (1 1)-LD (n, m) and it faces each other with a certain area, and electrostatic capacity which accompanies the laser component itself, and the capacity is usually 1-5pF.

[0028] Although it generates in each of the vertical resonance mold semiconductor laser components LD (1 1)-LD (n, m) and that capacity is several pF per one as C (n, m) showed to drawing 5 , this electrostatic capacity (capacitor 15) When its attention is paid to the line wiring 3 (or train wiring 2) of one, they are m pieces (). or the electrostatic capacity C of n pieces (capacitor 15) has connected, and abnormality luminescence of the semiconductor laser component in nonluminescent timing occurs, or In actuation by the current pulse which is the above-mentioned semiconductor laser actuation approach of the passage former, it is the cause which makes control of luminescence reinforcement impossible. In addition, drawing 5 is the same configuration as drawing 1 , and drawing 1 is drawing which omitted Capacitor C from drawing 5 , and the resistance 13 and 14 shown in drawing 4 is omitting the graphic display to drawing 1 and drawing 5 .

[0029] Next, drawing 2 is the example of a configuration of the quantity of light programmed-voltage impression section 5-1 for setting the potential according to luminescence reinforcement as the predetermined vertical resonance mold semiconductor laser component LD of the two-dimensional vertical resonance mold semiconductor laser luminescence equipment by the gestalt of this operation beforehand - 5-n. In drawing 2 , from the controller which is not illustrated, the D/A converter 7 changes into an analog value the 8-bit quantity of light setting-out data given in digital one, and sends them to the buffer section 8. bit of this quantity of light setting-out data -- a number does not need to be 8 bits and can be changed according to an application. Moreover, when this quantity of light setting-out data is analogically given from a controller, this D/A converter 7 is omissible and should just carry out direct continuation of the quantity of light setting-out data to the buffer section 8.

[0030] The buffer section 8 outputs a quantity of light programmed voltage in response to the output of the D/A converter 7.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is drawing showing the configuration of the vertical resonance mold two-dimensional semiconductor laser array luminescence equipment by the gestalt of operation of this invention.
[Drawing 2] It is drawing showing the example of a configuration of the quantity of light programmed-voltage impression section 5 for setting up beforehand the potential according to luminescence reinforcement in the vertical resonance mold two-dimensional semiconductor laser array luminescence equipment by the gestalt of this operation.
[Drawing 3] It is drawing showing the example of a configuration of the laser driver voltage impression section 4 for directing the luminescence timing of a vertical resonance mold semiconductor laser component in the vertical resonance mold two-dimensional semiconductor laser array luminescence equipment by the gestalt of this operation.
[Drawing 4] It is drawing showing the typical equal circuit of a vertical resonance mold semiconductor laser component.
[Drawing 5] It is drawing showing the configuration of the vertical resonance mold two-dimensional semiconductor laser array luminescence equipment by the gestalt of operation of this invention.
[Drawing 6] It is drawing explaining the actuation approach of the vertical resonance mold two-dimensional semiconductor laser array luminescence equipment by the gestalt of operation of this invention.
[Drawing 7] It is drawing explaining the actuation approach of the vertical resonance mold two-dimensional semiconductor laser array luminescence equipment by the gestalt of operation of this invention.
[Drawing 8] It is drawing showing the configuration of conventional two-dimensional semiconductor laser array luminescence equipment.
[Drawing 9] It is drawing which reexpressed the configuration of the conventional two-dimensional semiconductor laser array luminescence equipment shown in drawing 8 .
[Drawing 10] It is drawing explaining the actuation approach of conventional two-dimensional semiconductor laser array luminescence equipment.
[Drawing 11] It is drawing explaining the actuation approach of conventional two-dimensional semiconductor laser array luminescence equipment.
[Drawing 12] It is drawing showing the I-L property of a level resonance mold semiconductor laser component, and an I-V property.
[Drawing 13] It is drawing showing the I-L property of a vertical resonance mold semiconductor laser component, and an I-V property.
[Description of Notations]
1 Formation Location of Two-dimensional Semiconductor Laser Array
2 Train Wiring
3 Line Wiring
4 Laser Driver Voltage Impression Section

5 Quantity of Light Programmed-Voltage Impression Section
7 D/A Converter
8 Ten Buffer section
12 Diode
13 14 Resistance
15 Capacitor
17 Actuation Current Pulse Generating Section
18 Enabling Electrical-Potential-Difference Generating Section

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[Translation done.]

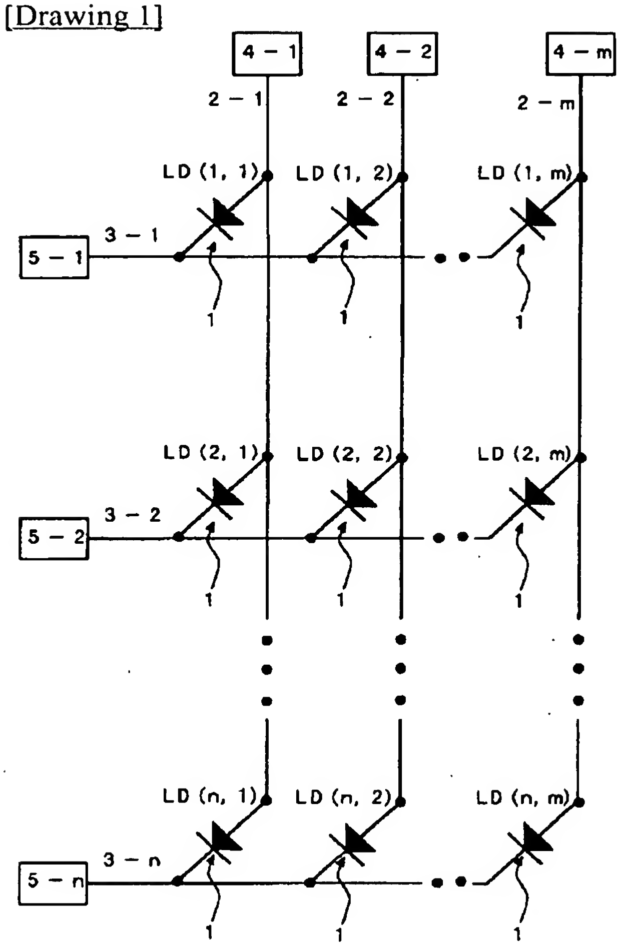
* NOTICES *

JPO and INPIT are not responsible for any damages caused by the use of this translation.

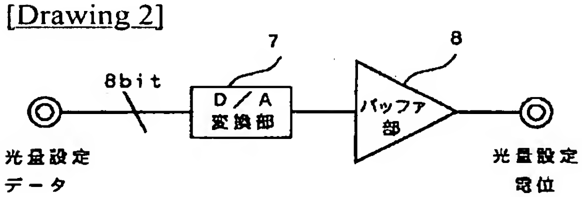
1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

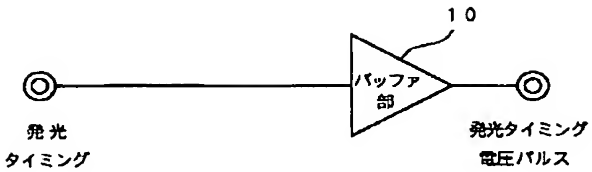
[Drawing 1]



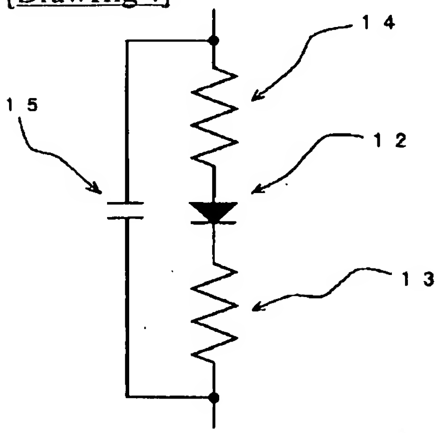
[Drawing 2]



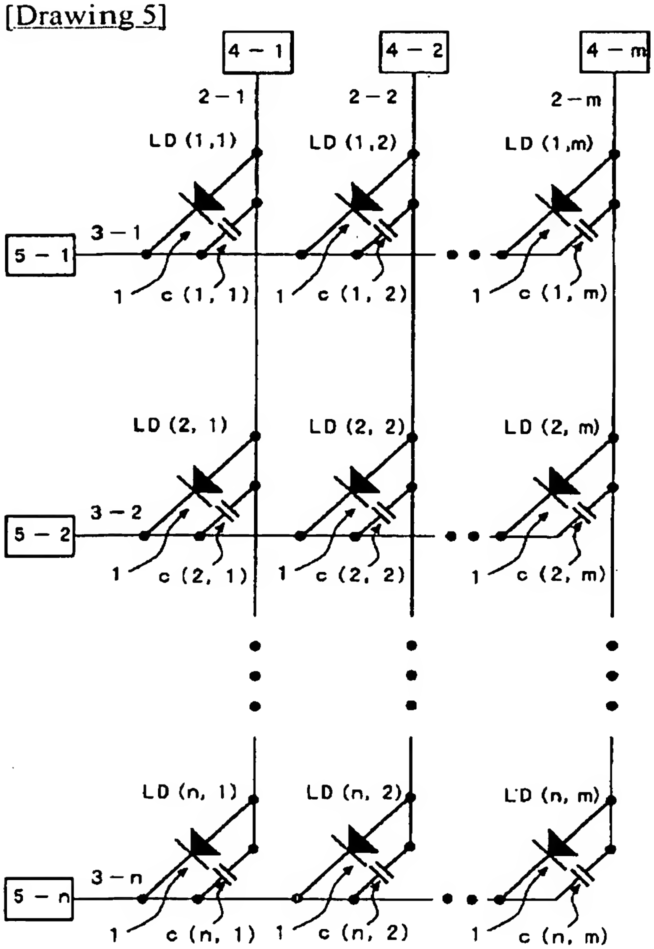
[Drawing 3]



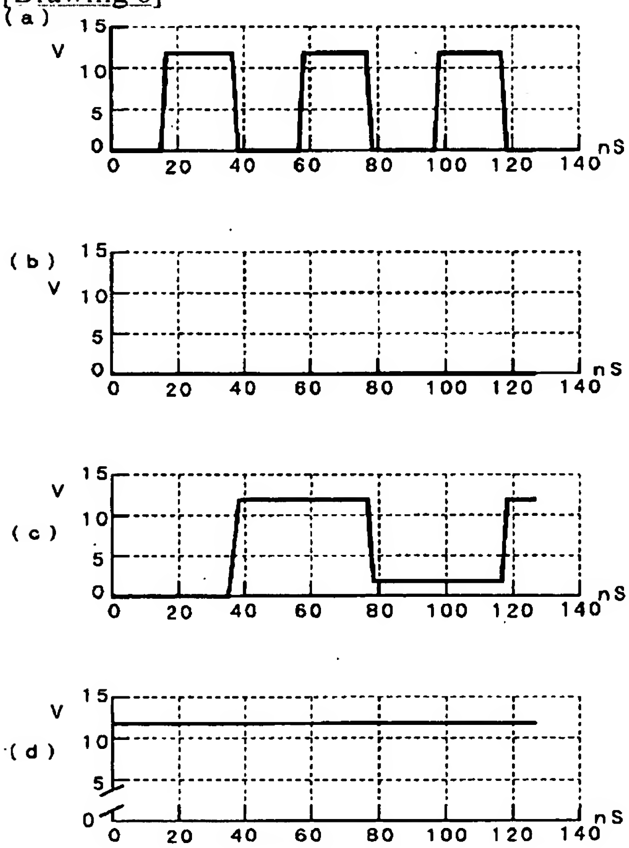
[Drawing 4]



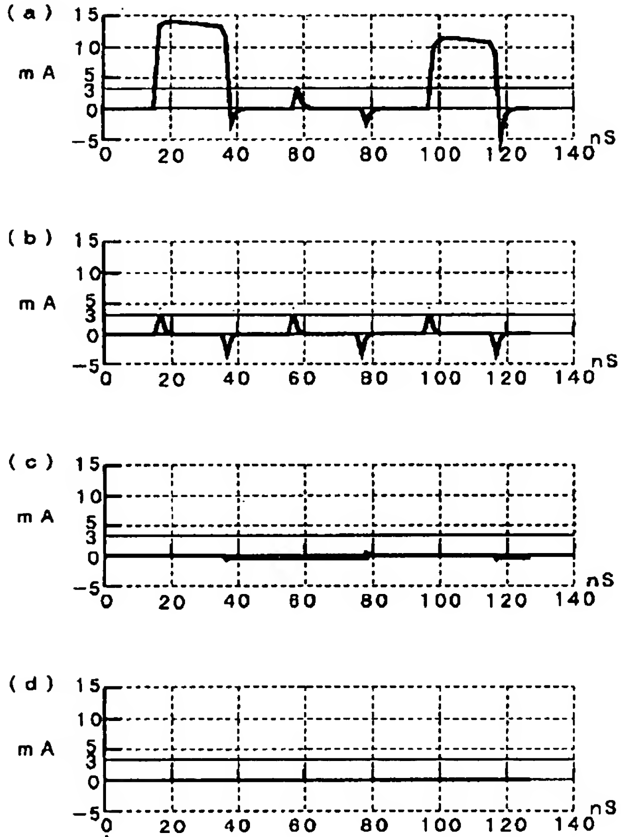
[Drawing 5]



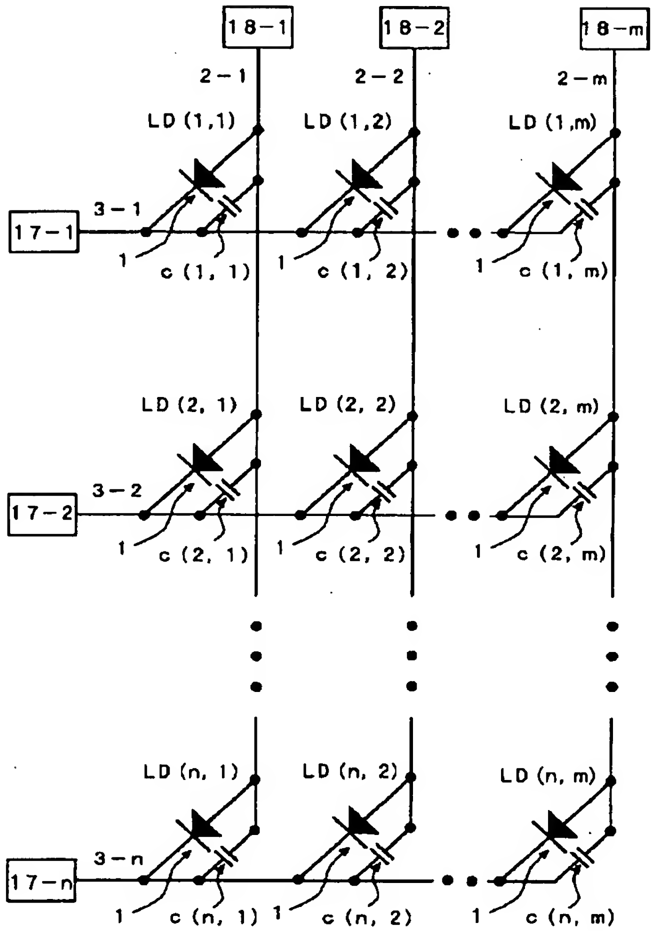
[Drawing 6]



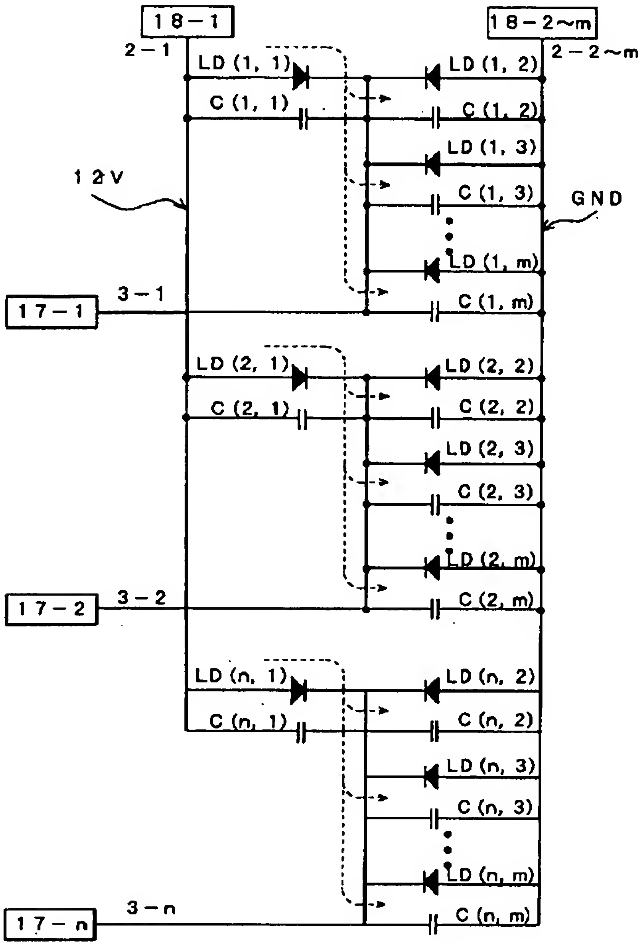
[Drawing 7]



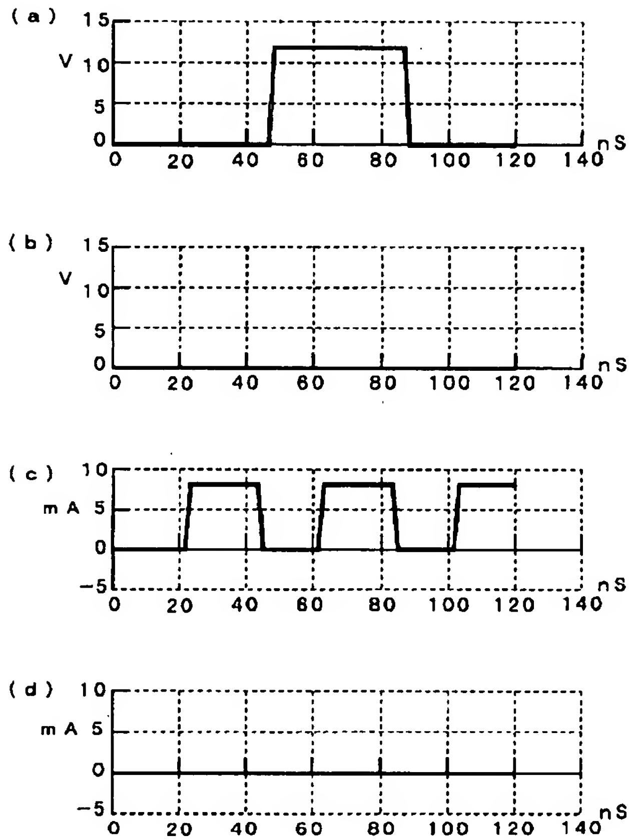
[Drawing 8]


18-1
18-2
18-m
2-1
2-2
2-m
LD (1,1)
LD (1,2)
LD (1,m)
17-1
3-1
1
c (1, 1)
c (1, 2)
c (1, m)
LD (2, 1)
LD (2, 2)
LD (2, m)
17-2
3-2
c (2, 1)
c (2, 2)
c (2, m)
LD (n, 1)
LD (n, 2)
LD (n, m)
17-n
3-n
c (n, 1)
c (n, 2)
c (n, m)

[Drawing 9]


18-1
18-2~m
2-1
2-2~m
LD (1, 1)
LD (1, 2)
C (1, 1)
C (1, 2)
LD (1, 3)
C (1, 3)
12V
GND
LD (1, m)
C (1, m)
17-1
3-1
LD (2, 1)
LD (2, 2)
C (2, 1)
C (2, 2)
LD (2, 3)
C (2, 3)
LD (2, m)
C (2, m)
17-2
3-2
LD (n, 1)
LD (n, 2)
C (n, 1)
C (n, 2)
LD (n, 3)
C (n, 3)
LD (n, m)
C (n, m)
17-n
3-n

[Drawing 10]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V
15
10
5
0
0
20
40
60
80
100
120
140
nS
(b)
V
15
10
5
0
0
20
40
60
80
100
120
140
nS
(c)
mA
10
5
0
−5
0
20
40
60
80
100
120
140
nS
(d)
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10
5
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−5
0
20
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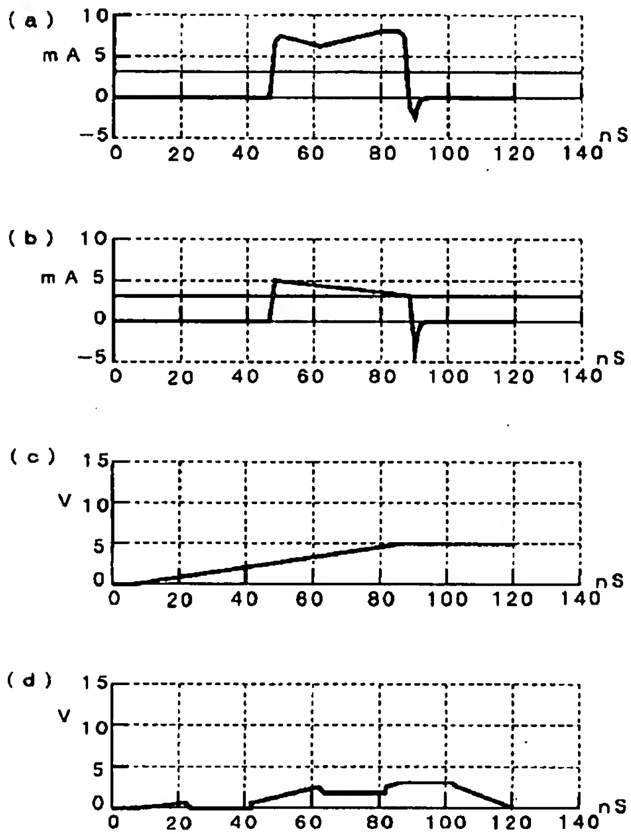
60
80
100
120
140
nS

[Drawing 11]


(a)
mA
10
5
0
-5
0 20 40 60 80 100 120 140
nS
(b)
mA
10
5
0
-5
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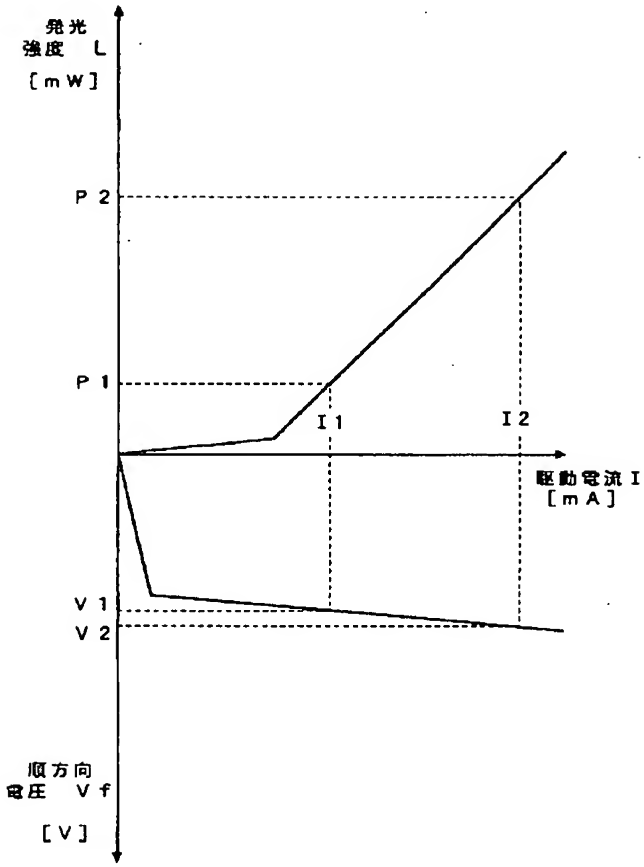
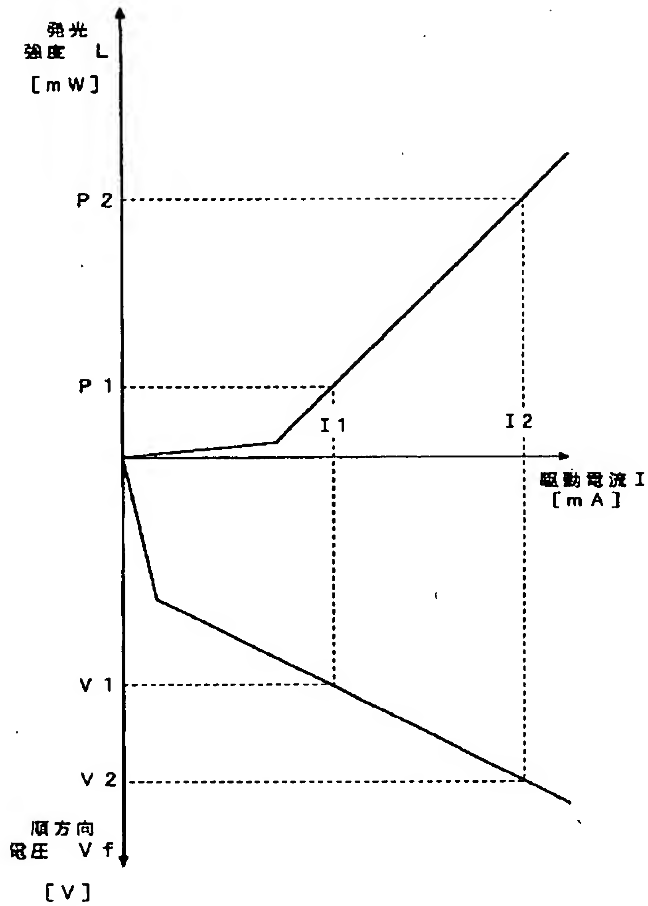
nS
(c)
V
15
10
5
0
0 20 40 60 80 100 120 140
nS
(d)
V
15
10
5
0
0 20 40 60 80 100 120 140
nS

[Drawing 12]



[Drawing 13]



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